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JUNE, 1858.

CIVIL ENGINEERING.

*On the Mechanical Effect of Combining Girders and Suspension Chains; and a Comparison of the Weight of Metal in ordinary and Suspension Girders to produce Equal Deflections with a Given Load.** By PETER W. BARLOW, Esq., C. E., F. R. S., F. G. S.

[Read before Section G of British Association.]

(Continued from page 309.)

CONCLUDING OBSERVATIONS.

The important practical results of the preceding experiments are:—

1st. That in suspension bridges it is essential that the platform should be stiffened with a girder to prevent vertical undulation.

2d. That the deflection of the wave of a girder attached to a chain similar to the Londonderry Bridge, will not exceed $\frac{1}{25}$th of the deflection of the same girder not attached to the chain.

3d. That, theoretically, the saving of supporting metal in a suspension bridge is one-half only to produce equal results, and may be made of great depth without practical difficulty; and as the deflection varies as the cube of the depth, a bridge on this principle, of such spans as the Londonderry Bridge, may be made under average circumstances with at least one-fourth of the metal of an ordinary girder bridge, having equal rigidity.

The results, Nos. 1 and 2, although at variance with the general practice of engineers, are still in accordance with such experience as we possess.

* From the London Artizan, Nov., 1857.

Suspension bridges, with a few exceptions, have been not only built of small depth without stiffening girders, either vertically or horizontally, but the points of suspension have not been fixed, but simply resting on rollers, so as to give every facility for movement; and thus arises the motion generally complained of in suspension bridges.

Moreover, suspension bridges have been built without any rule or supervision; and as they will bear their own weight, however lightly constructed, they have been in most cases of insufficient strength, several now existing not having $\frac{1}{8}$th the strength given in the Derry Bridge.

In a few cases where a girder has been used, the results accord with my experiments. The Niagara Bridge, of 820 feet span, has a girder very little deeper than the Derry Bridge, and built of timber only; yet the deflection from a train is not more than 5 ins., as appears from the report of Mr. Roebling.

Another case is that of the Inverness Bridge, which has a wrought iron parapet 3 ft. 6 ins. deep, and is nearly represented by the small wrought iron model.

This Bridge has been subjected to the test of a locomotive passing over it on a truck, drawn by fourteen horses, which produced so little deflection, as appears from the report of Mr. Rendel, that a member of the Institution of Civil Engineers, when the subject was mentioned, expressed his doubt of the fact. It is, however, satisfactorily explained by the preceding experiments, which prove that such a parapet is sufficient, from the deflection varying as the cube of the length, to render a suspension bridge so nearly rigid, that no deflection would be observable without measurement.

There are other cases of suspension girder bridges—viz: the Montrose Bridge in Scotland, the Kief Bridge in Russia, consisting of four spans of 440 ft. each, in both of which it is reported that objectionable movement is cured.

In America, suspension bridges have been used for aqueducts, the trough acting as a girder, the success of which proves that all vertical and horizontal oscillation has been cured.

I will conclude my Paper by remarking that it has been necessary, in the preceding investigation, to make reference to the existing works of eminent engineers; I am desirous to observe that such comparisons have been essential to the elucidation of the question, and that I have no intention for one moment to detract from the engineering merit of these great works. The genius exhibited in overcoming the various difficulties which presented themselves during their execution, must be evident to all, but especially to those whose profession renders them acquainted with what had to be contended with.

At the time they were designed, the popular objections to suspension bridges were much greater than at present, and no example existed of a railway suspension bridge.

An engineer might then have been as little justified under such circumstances in adopting for railway traffic a suspension bridge, as he would now be in error in disregarding the experience which has since been obtained.

I have not the least doubt of the sufficiency of the Londonderry

Bridge for the heaviest trains at the highest speeds; my own views, from large experience in railway construction, from the effect produced on bridges crossed by contractors' wagons drawn by horses, and from experiments made on trains at speed with the Iron Commissioners, that road traffic gives as severe trial by troops marching in step, by herds of cattle, or by cavalry at speed, as the heaviest trains at full speed on railways; and that, provided the deflection of a suspended girder is not permitted to exceed that of an ordinary girder, being entirely within the elasticity of the metal, no injury can occur, whatever may be the speed.

This is not, however, the subject, but I now submit it for discussion: the first step in the inquiry is the simple mechanical problem on which no doubt should exist; and when it is remembered that the extension of the railway system is much governed by the cost of construction, of which the crossing of valleys and rivers form so considerable an item, that in some cases a single bridge costs as much as 75 or 100 miles of line, I hope the inquiry will be deemed of sufficient importance by the Association to elicit a full investigation and discussion.

Appendix A.

Estimate of Deflection of Londonderry Girder, from Experiments on the Boyne Viaduct.

The centre opening is, . . .	264 feet.
Weight of girder, ...	300 tons.

540 tons all over produces a deflection of 1·9 ins.

The deflection, if of the Londonderry Bridge, would have been $264^3 : 440^3 :: 1{\cdot}9 : 8{\cdot}79$ ins.

To ascertain the deflection, if of the same depth as the Londonderry Bridge, we have $16{\cdot}5^3 : 22{\cdot}5^3 :: 8{\cdot}79 : 22{\cdot}289$ ins.

This assumes a weight per foot forward equal to the Boyne Viaduct. The Boyne Viaduct, if of the same length as the Londonderry Bridge, would weigh 512 tons all over.

The following will, therefore, be the deflection, if of the same weight as the Derry Bridge:—$150 : 512 :: 22{\cdot}289 : 76{\cdot}078$, which is the deflection with 540 tons all over.

200 tons all over will therefore be, .	28·17 ins.
100 tons in the middle, . . .	23·53 "

Estimate of the Deflection from Experiments on the Newark Dyke Bridge.

Span, ...	240 feet.
Weight of girder, ...	244½ tons.

Deflection with 240 tons all over, 2·75 ins.

As $240^3 : 440 :: 2{\cdot}75 : 17$ ins.

The depth of the Newark Bridge being the same as the proposed Londonderry Bridge, 17 ins. will indicate the deflection, if it was equal in weight to the Newark Dyke Bridge; but the weight, if of the same length, being 450 tons, we have $150 : 450 :: 17{\cdot}51$ ins., the deflection with 240 tons all over; with 200 tons all over, 42·5.

With 100 tons in the middle it will, therefore, be 34 ins.

Estimate of the Deflection of the Londonderry Girder, from Experiments on the Britannia Tube.

The Britannia tube weighs 1600 tons, and deflects with 200 tons all over 1·28 ins.

The deflection of the Britannia tube, if reduced to 150 tons, would be 12·8 ins.

The depth practically of the proposed Londonderry Bridge is 16½ ft.: and of the Britannia tube, 28 ft. $16^3 : 28^3 :: 128$, or as 449·21 : 2195·20 : : 12·8 : 62·6, which has to be reduced in the ratio of the cube of the span, $460^3 : 440^3 :: 62{\cdot}6 : 53{\cdot}08$ ins., the deflection of the Londonderry girder with 200 tons all over.

The mean of the three results indicates 41·25 ins. as the deflection of a girder of 150 tons; or $\frac{41{\cdot}25}{25} = 1{\cdot}65$, will therefore be the deflection when attached to the chain, with 200 tons over half the girder.

Appendix B.

Dimensions of Londonderry Bridge, and Calculation of Strains and Deflection.

Span between points of support,	451 feet.
Length of the girder,	440 "
Depth at high tower,	88 "
" side "	59 "
Centre catenary ½ horizontal length,	246 "
Side, " "	205 "
Length ½ catenary (centre,)	266·2
" (side,)	215·5

Strain on cable at high tower with 3 tons per foot load, assuming ⅛th to be supported by the girder, and 2½ tons by the chain, according to the formula.

$$T = \frac{W}{4x} \times \sqrt{4x^2 + Y^2} = \frac{1200}{4 \times 88} \times \sqrt{4 \times 88^2 + 246^2} = 1031 \text{ tons.}$$

x representing depth of catenary.
Y " half span.
W " weight equally distributed.
T " tension.

Section of the cable at high tower, so that no strain exceeds 5 tons per inch, 206 ins.

Strain of the cable at the side tower, $\frac{1000}{4 \times 59} \times \sqrt{59^2 \times 4 + 205^2} = 1000$ tons.

Section of cable at side tower,	200 ins.
Horizontal strain,	840 tons.
Section of iron at bottom of chain,	168 ins.

Deflection from Expansion and Contraction.

This calculation assumes that the expansion between summer and

winter is $\frac{1}{300}$th part of the length, and that it produces a strain of 5 tons per inch.

The exact length of the chain from the formula—

$$z = \sqrt{y^2 + \tfrac{4}{3}x^2}, \text{ or } \sqrt{246^2 + \tfrac{4}{3}88^2} = 266{\cdot}160\,;$$

z being half length of catenary.
y being half-chord, and
x being versed sine.

Add elongation of half the cable, ·133

266·293

$$x = \sqrt{\tfrac{3}{4}z^2 - y^2} = \sqrt{\tfrac{3}{4}\,266{\cdot}293 - 246} = 88{\cdot}3$$

The deflection, therefore, from the temperature will be ·3 of a foot, or 4 ins., a deflection much under ordinary suspension bridges, arising from the great depth, without deducting the expansion of the cast iron towers, which will amount to $\frac{1}{2}$ an inch.

The same deflection, of course, indicates the effect of three tons per foot on the bridge, as this weight produces five tons per inch strain on the cable. 1 foot per ton, all over, will therefore cause a deflection under $1\frac{1}{2}$ ins.

Appendix C.

In the design for the proposed Londonderry Bridge, ornamental cast iron towers are proposed. As a mechanical question, we must estimate them as cast iron columns acting simply to carry weight, which, if they were so designed, would be as follows:—

The weight to be supported by the large tower, when the bridge has its extreme load, is 1500 tons. To give 4 tons per inch, we require 375 ins., or 3750 lbs. per yard.

The high towers being 30 yards high, the weight of metal will be 50 tons.

The low tower will have 1320 tons, with a full load, $\frac{1320}{4} = 330$ ins. or 3300 lbs., per yard; the height being twenty yards, the weight will be 30 tons.

The mean of the two towers will require for direct strain,	40 tons.
Add 50 per cent. for bolts and ineffective metal,	20 "
	60 tons.

Appendix D.

Estimate of the Weight of Suspension Bars.

The weight to be carried is 1100 tons. If we allow 5 tons per inch, the section required is 220 ins., or 2200 lbs. per yard; the average length is ten yards, and weight, . . 10 tons.
Add 50 per cent. for ineffective metal, . . 5 "

15 tons.

*On the Relative Evaporating Power of Brass and Iron Tubes.**

By Mr. George Tosh, of Maryport.

[Read before the Institution of Mechanical Engineers.]

Brass and iron tubes for locomotive, marine, and other boilers, having been so extensively employed, their respective properties and defects are generally known under the various trying circumstances and situations in which they have been used; but, as there is still a difference of opinion existing on the subject of their relative advantages, the following experiments were made by the writer with great care, for the purpose of arriving at the truth, if possible, and for his guidance, as to the relative evaporating power of brass and iron tubes.

The writer having had the superintendence of locomotive and other engines for a number of years, has used considerable numbers of both brass and iron tubes, in several cases with apparently equal success; the former having generally been preferred for locomotive engines working at a high pressure, because there is less difficulty in keeping them fast in the tube plates, and the adhesion of the deposit from bad water is not so great on brass as on iron; and it is well-known that when iron tubes once become leaky, their ends are speedily wasted, and cannot afterwards be depended upon. Although brass tubes are generally adopted by the railway engineers of England, in preference to iron, there are companies using iron ones largely at the present time; and some engineers express their surprise at any other material than iron being used for that purpose.

Fig. 1. Vertical Section.

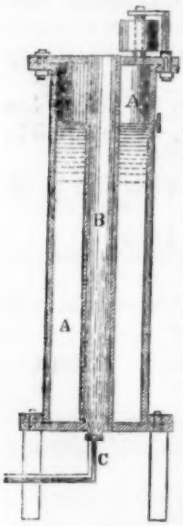

Fig. 2. Transverse Section.

Some time ago the writer's attention was drawn to a paper on this subject in the "*American Railroad Journal*," from which the following is an extract:—"It has been for many years, and still is, the practice of scientific men to recommend copper in preference to wrought iron for boilers to heat water or other fluids, on the ground of the superior conducting power of the former over the latter metal; and it will doubtless appear strange to many that a doctrine so well established should now meet with the most unqualified dissent. The superior conducting power of copper over iron admits of no doubt; and yet, upon this correct basis, has been raised a fallacious doctrine, resulting in a great waste of money by the use of copper instead of iron in the boilers of steamboats and locomotives. Iron absorbs heat so much more rapidly than copper, that many explosions have occurred which would not, had copper been used; although this is admitted, it is too bad to praise copper for this also, that it will not let a boiler blow up, when, everything considered, it ought to blow up, if a good fire and a good medium through which to convey its caloric into the water have any virtue in them. Copper cannot be a good medium through which to raise steam and a bad one to blow up with; yet the argument means

*From the Lond. Artizan, Feb., 1858.

this, if anything: nevertheless, it is admitted that this is not the ground on which any dependence can be placed, because, whenever such a catastrophe has happened, it has arisen from a defective arrangement of the boiler; in fact, the greatest defect that can properly occur in the designing of a boiler, the want of a complete and thorough circulation of hot water in pipes for the purpose of warming buildings."

As these views are so directly at variance with the general views of the engineers of this country, the writer determined on making experiments for himself, being unable to obtain any information on the subject that could be relied on. Two vertical boilers A, Figs. 1 and 2, were therefore constructed of equal dimensions, 6 inches diameter and 2 feet long, with a single tube, B, in the centre of each, 2 inches external diameter and No. 14 wire gauge thickness, of brass and iron respectively. The two boilers were filled with water of the same quality and of the same temperature, and alternately placed upon a stand in the same position over a gas flame, C; they were each exposed to the action of the gas for the same length of time, which was equivalent to the same quantity of fuel being consumed in each case; and the height of water was carefully gauged after each experiment as soon as ebullition had ceased. The experiments were first made during the day, and afterwards at night, at times when there was the least probability of a change of pressure in the gas pipes during the period of the experiment, by lighting or extinguishing the gas in the town.

The annexed Table shows the results of eight experiments made with the above apparatus, the quantity of water evaporated being measured by the number of inches that the level of the water in the boiler is lowered in each experiment: the average shows that 2 lbs., cwts., or tons of fuel, with brass tubes, evaporate the same quantity of water as $2\frac{1}{2}$ lbs., cwts., or tons of the same fuel with iron tubes; hence the evaporating power of brass is to that of iron as 125 : 100, or brass will evaporate about 25 per cent. more water than iron with the same quantity of fuel.

TABLE *of Experiments on the Relative Evaporating Power of Brass and Iron Tubes.*

Description of Tubes.	Quantity of Water Evaporated.								
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	Average.
	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Brass, . .	2	$\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{8}$	3	$3\frac{1}{4}$	$3\frac{1}{4}$	3	$2\frac{1}{2}$
Iron, . .	$1\frac{3}{8}$	$\frac{7}{8}$	2	$1\frac{1}{2}$	$2\frac{3}{8}$	$2\frac{3}{4}$	$2\frac{3}{4}$	$2\frac{1}{4}$	2

Further experiments were made with brass and copper tubes, and copper was found to be fully as much superior to brass as brass is to iron; so that the evaporating power of copper is to that of iron as 156 : 100, or copper will evaporate about 56 per cent. more water than iron with the same quantity of fuel.

—

Mr. MCCONNELL inquired whether the two sets of tubes used in the experiments were exactly the same gauge in thickness, since a little

difference in that respect would sensibly affect the result of such experiments, as they were on a small scale compared with actual practice.

Mr. Tosh replied that the tubes were gauged as exactly as possible, special care being taken to make sure of having the same thickness in all; the water was also gauged when cold in each case, to avoid any error from expansion of the water; and from the precautions taken to prevent sources of error in the experiments, the results obtained could be attributed only to the different conducting power of the two metals.

Mr. W. B. Johnson asked how the uniform pressure of the gas throughout all the comparative experiments had been ensured, and whether a metre had been used to measure the consumption exactly, as the quantity consumed might vary so much with ordinary variations of pressure as to affect the results materially.

Mr. Tosh said the consumption of gas had been regulated only by having the same burner burning for the same length of time. Measuring the quantity by a metre would certainly have been more complete; but he thought from the precautions taken there could not be any perceptible error from that cause. Application was made to the gas works at the time of the experiments, and a uniform pressure ensured during the time they were in progress, which was only half an hour on each occasion.

Mr. W. B. Johnson was much surprised at the result obtained from the experiments, as it was quite different from the results of his own experience, and he had been led to the conclusion that there was no appreciable difference between the two metals in effective evaporating power. He had had a good opportunity of comparing them on a large scale in two boilers of 160 H. P. each, which had been made exactly alike, except that one had iron and the other copper tubes; and the result of their working was found to be so equal that no difference could be decided upon between them. He inquired whether, in the experiments described, each pair of experiments that were compared together were made at the same time.

Mr. Tosh said that each pair of experiments were made not at the same time, but immediately following each other; first the brass tubes, and then the iron tubes, forming the pair for comparison; and then the same alternation again. He was now preparing for carrying out the experiments on a larger scale, and hoped soon to obtain more extensive results; in all the experiments that he had tried, iron and brass only were employed, not copper, as his object was to asscertain the relative value of tubes made of iron and brass.

Professor Rankine observed that a number of experiments had been tried many years ago by Mr. James R. Napier with experimental boilers of iron and copper of various thicknesses heated over the same gas flame, and he found only a small difference in evaporating power of about $\frac{1}{20}$th or $\frac{1}{30}$th in favor of the copper. In all experiments of the kind the state of the heating surface was important, whether smooth or rough, and whether perfectly clean or incrusted to any extent. The effective evaporating result of transmission of heat through the metal, depended on three properties:—1st, the resistance of the first surface to absorption of heat from the heated air and gases; 2d, the resistance of the internal particles of the metal to the conduction of heat; and 3d, the resistance

of the second surface to giving off heat to the water. Those three properties were not possessed in the same proportion by different bodies; the resistance to internal conduction was less in copper than in iron, but the resistance of the surface was greater in copper. Peclet found, in one of the best series of experiments on the subject yet made, that when the surface became dull the transmission of heat through all metals was very nearly the same.

Mr. SIEMENS thought the difference was so great and so uniform in the results obtained from the experiments described in the paper, that it could not be accounted for by any unobserved variation in the quantity of the gas consumed, as that would not have caused a marked difference all on one side; he thought the experiments did not afford a true criterion of what brass and iron tubes would do in a locomotive boiler, as the mode of action and the currents of heated gases differed so much in these vertical tubes heated by gas flames below, from those in the numerous horizontal tubes of a locomotive boiler. With the small gas flame, the air before coming in contact with the sides of the tube might be cooled down nearly to the temperature of the water, and the relative effect of resistance at the surface of the metal and in the interior would be materially altered, a low temperature leaving but little difference between the two bodies to overcome the resistance; the proportion of air carried through the two sets of tubes might also be varied by the effect of the temperature on the draft. The brass tubes might gain an advantage from their smoother surface causing less adhesion of the minute bubbles of steam during slow ebullition, though that circumstance would not apply in rapid ebullition. The internal conducting power of copper had been proved by Dr. Ure's experiments to be so good that the thickness of the metal did not perceptibly retard the rate of evaporation, though with iron the result was decidedly affected by the thickness.

Mr. R. ROBERTS thought the trial of the converse experiment of the time of cooling from the boiling point in two similar vessels of copper and of iron might be serviceable. He had found that the thickness of metal with copper as well as with iron materially affected the evaporating power, and that the thickness of plate when considerable, much retarded the passage of heat, and caused the metal to be injured by overheating, the heat not being carried off by the water fast enough; he had found brass tubes of No. 18 wire gauge last considerably longer than others of No. 14 wire gauge under the same circumstances, and supposed that was owing to their transmitting the heat to the water more quickly, and therefore the metal suffered less than in the thick tubes.

Mr. HAWKES suggested the trial of corresponding experiments with tubes made of brass, copper, and iron, the lengths of which should be inversely as the conducting power of the metal.

Mr. CRAIG thought the temperature should also be tried in the experiments by a thermometer put into the tubes; the circumstances were certainly different in the experiments from those in locomotive boilers, in consequence of the exposure of the experimental tubes to currents of air. He had not found much difference in practice between brass and iron tubes in locomotive boilers, and did not know any definite result in favor of either of them as to evaporating power.

Mr. HENRY MAUDSLAY observed that, in steam engine boilers, particularly marine and stationary, there were often other reasons affecting the question of the use of copper or iron, besides merely the conducting power of heat; such as durability under exposure to rusting or corrosion, and the relative accumulation of incrustation. He had known a case of nine marine boilers ordered for Naples, of copper, to allow of laying up without suffering from rust; for iron boilers were sometimes seriously damaged in eighteen months, whilst copper boilers were not affected; and this became then a more important question than original cost or conducting power.

AMERICAN PATENTS.

List of American Patents which issued from March 2d, to March 30th, 1858, (inclusive,) with Exemplifications.

MARCH 2.

1. For an *Improved Bellows;* Jacob Arndt, Wheeling, Virginia.

Claim.—"The combination of the trunk with the lower plunger, the upper plunger, and the blast gauge."

2. For a *Machine for Stoning Cherries;* Joseph Baker, Washington City, D. C.

Claim.—"The perforator, by which the stone is extracted from the pulp of the fruit, and the beveled feeding slide. Also, the combination of the perforators, the bent lever, and feeding slide."

3. For an *Improvement in Manure Wagons;* Jethro W. Barnes, Murfreesboro', North Carolina.

Claim.—"Converting the broad-cast distributor into a drill machine by reversing the axle. Also, the movable side or end, in combination with the sliding bottom, whether the machine is used for a drill or broad-cast machine."

4. For an *Improvement in Metallic Carriage Wheels;* Waldron Beach, Baltimore, Maryland.

Claim.—"The combination and arrangement of the several parts, whereby I have made a strong, light, durable, and cheap metallic wheel, which consists of but three essential parts, while I have preserved all the important qualities of a good carriage wheel in the highest degree."

5. For an *Improved Compound Pendulum;* Dana Bickford, Westerly, Rhode Island.

Claim.—"The arrangement and combination of the rods, levers, and the bob, so that by the expansion and contraction of rods, the position of the bob upon the rod will be changed."

6. For an *Improved Method of Bending Shovel Handles;* Thomas Blanchard, Boston, Massachusetts.

Claim.—"The method of confining the wood while being bent, to wit, by means of a key arranged to pass through straps, and also through the handle."

7. For an *Improvement in Machines for Breaking Coal;* Aquila Bolton, Port Carbon, Pennsylvania.

Claim.—"The arrangement, consisting of the perforated internally ribbed or toothed conical chamber revolving in one direction, and the toothed shaft or roller revolving in an opposite direction, for the purpose of breaking coal."

8. For an *Improvement in Paddle Wheels;* Andrew Buchanan, City of New York.

Claim—"The arrangement of the ventilating pipes, in combination with the arches between the floats."

9. For an *Improvement in Harvesters;* J. S. Butterfield, Philadelphia, Pennsylvania.

Claim.—"The reversible cam constructed with the grooves in opposite sides, so that the sickle may be driven with either of two different speeds, for the cutting of either grass or grain, as may be desired. Also, the bars with the finger bar and platform attached, in connexion with the lever and wheel, the whole being constructed and arranged relatively with each other and the axle."

10. For an *Improved Eccentric for operating Steam Valves;* Benjamin Carley, Paterson, New Jersey.

Claim.—"In combination with the method of shifting the eccentric, or its equivalent, to vary the point of cut-off or reversing the engine, the so forming the ways or slides, that by the one motion and mechanism the required lead shall be given to the valve motion, by the act of shifting the point of cut-off or reversing the engine."

11. For an *Improved Bolt Machine;* Henry Carter, Pittsburgh, Pennsylvania.

Claim.—"1st, The use of a stationary heading tool arranged centrally to the converging dies. 2d, The use of a swinging hammer for upsetting the head, in combination with the converging side dies and corner dies."

12. For an *Improvement in Harvesters;* Willis L. Childs, Piermont, New York.

Claim.—"The arm, bars, and slide, operated and arranged so that by their joint operation the twine or cord is adjusted around the sheaf, cut from the main portion, and the ends twisted and tucked under the band. Also, in combination with the above binding device, the rake, operated so as to have a proper relative movement with the parts constituting the binding device, whereby the cut grain is raked into the receptacle at the proper time. Further, the discharging device, formed of the lever actuated from the axle through the medium of the lever and rod, when used in connexion with the rake and binding device."

13. For an *Improvement in Continuous Metallic Lathing;* Birdsall Cornell, City of New York.

Claim.—"Forming metallic surfaces for the reception of castings of plaster, &c., of sheets of metal, after they have been swaged into alternating elevations and depressions of a retaining shape."

14. For an *Improvement in Operating Window Blinds;* Theodore Christian, City of New York.

"This invention consists in tightening the straps by adjusting the rods to which the ends of the straps are attached."

Claim.—"Tightening the straps by adjusting the pieces."

15. For an *Improvement in Harrows;* Orman Coe, Port Washington, Wisconsin.

Claim.—"The combination with the bars of a harrow frame of a series of revolving, circular, conical or concave forked harrow teeth, said teeth being arranged oblique to the line of draft, and operating unitedly."

16. For an *Improvement in Metallic Ties for Cotton Bales;* Frederic Cook, New Orleans, Louisiana.

Claim.—"The 'friction clasp' or buckle for attaching the ends of iron ties or hoops for fastening cotton bales and other packages, so that the ties are prevented slipping by the friction against a certain portion of the buckle. Also, the looping of the ends of iron ties or hoops for bales into a buckle, by the form of which they are prevented slipping by friction, when the strain of the expansion of the bale comes on the ties; the ends of the hoops or ties not being attached together in any way, the connexion being formed by a distinct buckle or friction clasp. Also, the slot cut through one bar of clasp, which enables the end of the tie or hoop to be slipped sidewise underneath the bar in clasp, so as to effect the fastening with greater rapidity than by passing the end of the tie through endwise."

17. For an *Improved Field Fence;* Peter S. Carhartt, Collamer, New York.

Claim.—"The mutually binding connexion of panels of portable fences, consisting of rails having angular grooves so as to lap over and to fit into the batten, said rails being arranged in relation to the batten. Also, in combination with pairs of panels, connected in the manner set forth, the shoes or sockets made of planks of triangular

form, fitting into spaces between the batten of both panels, so as to secure their relative position in a permanent manner."

18. For an *Improved Machine for Cutting the Moulding for Sash;* O. K. Collins, Murfreesboro', Tennessee.

Claim.—"The two-fold and adjustable planes, in combination with the removable posts and a reciprocating way, for the purpose of cutting mouldings of window sashes."

19. For an *Improved Apparatus for Supplying Water to Boilers;* John N. Dennisson and Thomas Sealy, Newark, New Jersey; patented in France, Aug. 26, 1857.

Claim.—"The combination of two chambers with each other and with a steam boiler, by means of pipes, stop-cocks, and valves, constructed and operating in such manner that the two chambers act alternately and interchangeably as receiving and distributing reservoirs to receive feed water, to heat it by the discharge of steam from the one vessel to the other, and to feed it to the boiler. Also, the combination of the said apparatus with a steam heating apparatus situated lower than the boiler, so that the condensed water is raised and returned to the boiler."

20. For an *Improvement in Harrows;* W. DeWitt and O. D. Barrett, Cleveland, O.

Claim.—"The arrangement of centre-pin, draft bar, arm, and weight, with harrow."

21. For an *Alarm Sash Balance;* Thomas Dunham and J. W. Briggs, Cleveland, O.

Claim.—"The combination of the alarm with the sash balance and window sash, for the purpose of alarming the inmates of a house when burglars open the window."

22. For an *Improvement in Hill Side Ploughs;* Samuel Dennis, Jr., Jasper, N. Y.

Claim.—"The combination of two mould-boards and shares with a single stationary land-side in the construction of a hill side plough."

23. For an *Improvement in Loop-chains for Jewelry;* C. W. Dickinson, Newark, N. J.

Claim.—"The concavo-convex links made entire."

24. For an *Improvement in Shaping and Punching Metals;* Julius C. Dickey, Saratoga Springs, New York.

Claim.—"The conical die, in combination with the finishing die and punch."

25. For an *Improved Farm Gate;* Andrew Dietz, Raritan, New Jersey.

Claim.—"The combination or arrangement of the rotating incline and friction roller, for the purpose of causing the gate to open or shut of its own weight according to the position of such incline, and in connexion therewith the arrangement of the cords and their springs, or their equivalent, to raise the gate and turn the incline."

26. For an *Improvement in Method of Raising Sunken Vessels;* Frederick G. Ford, City of New York, and Pascal Plant, Washington, D. C.

Claim.—"The chain provided with one or more internal chains, and used in connexion with the tube, or any equivalent device. Also, the arrangement for operating the tube and chain, to wit, the framing provided with the pulley and pinions, which gear into the racks, made respectively in the tube and chain."

27. For an *Improvement in Sash Fasteners;* Wm. H. Forbes, City of New York.

Claim.—"The within described device secured to the sash."

"The device is composed of two pieces of metal secured together by means of a hinge, or themselves forming the hinge—the lower portion is made perfectly straight and plain, with holes in it for the purpose of securing it to the sash—the upper portion is bent at a right angle at its extremity, and is rendered solid and firm by the triangular support, and enters an aperture in the upper sash when it is desired to lower or elevate either of the sash."

28. For an *Improvement in Registers for Hot Air Farnaces;* James W. Geddes, Baltimore, Maryland.

Claim.—"The mode of constructing the fire-proof setting for registers for hot air furnaces, the same consisting in the employment of one or more ventilated casements surmounted by a perforated cap of non-conducting incombustible material—I claim the flaring tubular terminations of the passages."

29. For an *Improvement in Coffins;* Daniel and Solomon E. Hooker, West Poultney, Vermont.

Claim.—"The employment of a skeleton frame, composed of strips of angular metal extending along the angles of the coffin, and firmly secured together so as to furnish the main support of the coffin, and at the same time a proper means of attaching the slab of stone and of securing tight joints. Also, the combination of this frame with a thin slab of slate, or other stone, whereby a coffin of superior strength, durability, and lightness is produced."

30. For an *Improvement in Mowing Machines;* Charles Howell, Cleveland, Ohio.

"This improvement consists in a new and improved mode of connecting the main frame to the truck frame, by means of which the height of the cut may be readily regulated as required, and at the same time the finger bar (or front part of the machine), allowed fully to accommodate itself to the inequalities of the ground."

Claim.—"The method of connecting the truck to the main frame of a reaper or mowing machine, and of regulating the height of the cut, &c."

31. For an *Improvement in Eccentric Explosive Shells;* Wm. W. Hubbell, Philadelphia, Pennsylvania.

Claim.—"The combination of the flat-based segment or bridge piece behind the flat-based re-inforce around the fuze hole, and the thinner sides or walls of the shell, with the external surface of the shell smooth and spherical."

32. For a *Machine for Making Paper Bags;* Jacob Keller, Fairview Township, York Co., Pennsylvania.

Claim.—"The treadle, shaft wheels, roller, lever, roller folders, and the devices, arranged in combination for the purpose of making paper bags."

33. For an *Improvement in Hominy Mortars;* John Keezer, Chilicothe, Ohio.

Claim.—"The construction of mortars for operating on moist corn, with perforations beveling outward, and presenting sharp edges on the interior."

34. For an *Improvement in Boot-trees;* Reuben L. Lewis, Milford, Massachusetts.

Claim.—"In mounted swiveling boot-trees combining the backs with the axial stretching rod, by means of the inclined guides and cross-heads, or other equivalent means, so that the backs can be readily changed."

35. For an *Improved Machine for Cutting Barrel Heads;* Wm. Manning, Rouse's Point, New York.

Claim.—"The arrangement of the annular plate, disk, hub, and cutters, whereby the stuff is held between the annular plate and the disk, and is simultaneously operated upon both sides, without changing the position of any part of the machine."

36. For an *Improved Machine for Cutting Barrel Heads;* James H. Mattison, Scriba, New York.

Claim.—"Automatically traversing the disk cutters in any manner, for the purpose of operating upon the heading either at the same time or alternately."

37. For an *Improved Hydrant;* John Parham, Philadelphia, Pennsylvania, and Samuel P. Parham, Trenton, New Jersey.

Claim.—"The peculiarly combined arrangement for a fire-plug or street hydrant, consisting of the case or cylinder of the plug or hydrant, which has its valve seat on a level with the bottom of the waste passage, so that the whole of the waste water may discharge into its main or supply pipe, a short distance above the lower end of the cylinder, so that the valve may be let down below out of the way of the free passage of the water, and the hollow revolving—but not rising and falling—female nut, which is made to operate the screw-rod of the supply valves, so as to force it down into the reception chamber below the supply pipe, and the waste valve fast to a spring, so as to be held closed when the main valve is opened, and open when it is shut."

38. For an *Improvement in Corn Huskers;* Warner Pickett and Andrew Hills, Naugatuck, Connecticut.

Claim.—"The combination of the inclined cylinder with the curved bar or trough, and the clearer."

"Our improvement consists in the use of a husking cylinder set with rings or sections

of card teeth or points, and an adjustable curved bar or trough for the ears of corn to slide in, so that they will fall against the card teeth on the cylinder, and a series of clearers to remove all the husks from the card teeth as the cylinder revolves, and a circular saw to cut off the stumps or shanks of the ears."

39. For an *Improved Hydrant;* James Powell, Cincinnati, Ohio.

Claim.—"1st, The combination of the two plungers working in line with each other, and the double chambered cylinder having two escape passages. 2d, The combination of the peculiarly shaped slotted cam and the crank, with the two plunger shafts."

40. For an *Improvement in Seeding Machines;* Aaron Ring, Westbrook, Maine.

Claim.—"I do not claim sowing seed by centrifugal force, nor the distributing tube, nor the bag hopper, nor the crank, nor the shaft, nor the slide at the bottom of the hopper, nor the revolving head, in and of themselves alone—but I claim the combination of these."

41. For an *Improvement in the Method of Setting Sugar Kettles;* Honoré Roth, Iberville Parish, Louisiana.

Claim.—"Setting the kettles known as the 'Battery' and 'Flambeau,' over separate furnaces in communication respectively with the kettles denominated the 'sirup' and 'propre,' and both communicating with the 'grande' or first kettle of the series on opposite sides of a division wall reaching nearly to the bottom of said kettle."

42. For an *Improvement in Sub-marine Grapples;* Thomas Sheehan, Dunkirk, N. Y.

Claim.—"The employment or use of the segment rack and pawl applied to the levers of the jaws, and actuated by means of the levers and cords or chains."

43. For an *Improved Machine for Forming Sheet Metal Pans;* E. A. Smead, Tioga, Pennsylvania.

Claim.—"The combination of the two dies, when arranged as shown, viz: the lower die being provided with the movable side pieces or strips, actuated by the guides as the die descends, the upper die being attached to the frame actuated by the cam, or its equivalent."

44. For an *Improvement in Harvester Fingers;* Henry C. Smith, Cleveland, Ohio.

Claim.—"The bars with the opening, the cone, with the cone cavity so formed in relation to the bar that the under side of the cone shall project below the said bars attached to the shank. This I claim when constructed and arranged as set forth."

45. For an *Improved Calendar Clock;* Holly Skinner, Huron, Ohio.

Claim.—"1st, The extra movable tooth and leap year wheel, applied to the year wheel to operate for the purpose of regulating the effective length of the tooth which represents the month of February. 2d, The arrangement of the mouth wheel, its attached pinion, and pin, the rack bar and its pawl, the spring, or its equivalent, the lever and its stud, or its equivalent, the catch, and the stop, the whole being applied to operate upon and be controlled by the year wheel of a calendar movement."

46. For an *Improvement in Bee-Hives;* Solomon Stansberry, Knoxville, Tennessee.

"This invention consists in a peculiar means employed for destroying within the hive the eggs of the bee-moth, thereby preventing their accumulation within the hive."

Claim.—"The cylinders placed within the hives or below them, and fitted within concaves arranged in any proper way, so as to operate as set forth."

47. For an *Improvement in Grinding Mills;* Hosea Southwick, Little Cooley, Pa.

Claim.—"The mode of grinding all kinds of grain into flour and meal, with a perpendicular stone fitting into a stone concave, and a counter stone or crusher on the top of the runner near the upper end of the concave; said counter stone or crusher is to crush the grain before it drops between the runner and the concave, thereby grinding faster and with much less power than common mills."

48. For an *Improvement in Harvesters;* Isaac Van Doran, Somerville, New Jersey.

Claim.—"The arrangement and construction of a sickle beam, so that it shall hold and keep firm the guard fingers, and also by means of the arched lip, keep the teeth close to the fingers, and permit the use of an open guard."

49. For an *Improvement in Rakes for Harvesters;* Isaac Van Doren, Somerville, N. J.

Claim.—"The arrangement or combination of the geared wheel, having spur and

face gearing, and shaft with its pinions, in connexion with the supporting roller and expanding levers, for the purpose of operating the rake by the roller; also, the connexion with the rake when operated by means of expanding levers, the trips, for the purpose of throwing the teeth in a vertical position to carry the grain from the platform."

50. For an *Improvement in the Manufacture of Scythes;* Harvey Waters, Northbridge, Massachusetts.

Claim.—"The new manufacture of cutting instruments, having the metal forming the cutting edge in the condition resulting from the previous crinkling or corrugating of the metal at right angles, or nearly so, with the line of the intended cutting edge, and then flattening it by a swaging operation in such manner that the crinkles or corrugations shall not be straightened out by simply bending."

51. For *Improvements in Lime-kilns;* Abner B. Weeks, Rockland, Maine.

Claim.—"My improved arrangement of a single hopper with respect to two separate stacks, such being placed at or over their upper ends, and so as to flare and increase in width from them upward, and communicate with them. Also, arranging air or cooling passages horizontally or with the inclinations under broad flat hearths of any suitable material, and in combination and connexion with the furnace of a lime-kiln by means of pipes or passages."

52. For an *Improvement in Horse Shoes;* Elbridge Wheeler, Marlborough, Mass.

Claim.—"The horse shoe as a new article of manufacture, the calks and shoe being of one piece of metal formed by drawing down the shoe, and without welding or turning up."

53. For an *Improved Burglars' Alarm;* Wm. D. Wright, Baltimore, Maryland.

Claim.—"Confining a torpedo within a chamber or box between weights or slugs, so that when said box drops and strikes against anything, the force or rebound of the weights shall cause the torpedo to explode, and thus cause an alarm."

54. For an *Improved Horse Shoe Machine;* Harry A. Wills, Keeseville, New York.

Claim.—"The peculiar arrangement of the shears in relation to the upper roller and the feeding bar, so that the cutter shall be brought into action, and the cutting off of the blank effected in the revolution of the upper roller, by means of the projection on the same, and the blank when cut off in a position to be certainly fed between the rollers. Further, in combination with the guide rollers attached to the bars, the auxiliary spring guides attached to the bars, and arranged to operate conjointly with the guide rollers. Also, loosening or shoving back the blank on the mould just previous to its entering the female die, by means of the vibrating or loosening bar."

55. For an *Improved Piano Lock;* Nathaniel Wilton, Boston, Massachusetts.

Claim.—"The construction of the bolt plate with slots, whereby said plate is guided in its two positive motions, and actuating the said bolt directly by the key in its motions."

56. For an *Improvement in Boxes and Journals for Railroad Car Axles;* Isaac P. Wendell, Philadelphia, Pennsylvania.

Claim.—"Employing in connexion with the boxes and journals of car axles and other shafts, a central lubricating collar revolving in an oil chamber formed in the lower bearing, in combination with a recess in the upper bearing, when the said recess is wider and deeper than the collar."

57. For an *Improvement in Machines for Regulating the Supply of Roving to Spinning Machines;* John B. Winslow, New Bedford, Massachusetts.

Claim.—"The combination of the secondary clutch and the main clutch, made to operate together upon one shaft, and to be operated by the fibrous material acting on the draw rollers, the same causing the shaft, and the bevel gear, and of course the delivering belt, to have their speed varied as circumstances may require."

58. For an *Improvement in Sewing Machines;* Joshua Gray, Medford, Assignor to self and George O. Brastow, Somerville, Massachusetts.

Claim.—"The device for distending the loop, consisting essentially of the sliding bar and the vibrating arms."

59. For an *Improvement in Locks;* John M. Perkins, Assignor to Robert M. Patrick, City of New York.

Claim.—"In combination with a set of tumblers, a set of stationary bars at one end,

and a set of washers at the other end of, and interposed between, said tumblers. Also, the yoke embracing the whole set of tumblers, in combination with a pin, or its equivalent, projecting out through the case, for the purpose of enabling the tumblers to be shoved together so as to cover each other, whereby the slots of the tumblers are caused not to coincide, thus preventing the bolt from being withdrawn."

60. For an *Improved Method of Operating Scroll Saws;* Henry F. Shaw, Assignor to self and Moses H. Gragg, Boston, Massachusetts.

Claim.—"The use of the two sets of double arms, and attaching the two ends of the saw to the centres of the strips which unite the extremities of said arms."

61. For an *Improvement in Sewing Machines;* Amos W. Sangster, Assignor to Victor M. Rice, James Sangster, and Eliza Remington, Buffalo, New York.

Claim.—"The frame work, slide, and toggle joint."

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62. For an *Improved Sawing Machine;* Thomas J. Alexander, Westerville, Ohio.

Claim.—"1st, The combination with the endless chain and drawing pin to the reciprocating feed carriage, of the carriage slide, set in independent motion at intervals, lever and pawls of the feeding ratchet, or their equivalents, for actuation of both the longitudinal and cross feeds. 2d, The gear of the cross feeding ratchet wheel, with the feeding roller, by frictional contact, and support or gear of said roller through centre points or end pins, with lever appliances, or their equivalents, at its end or ends, to admit of the free run of the roller independent of its frictional contact with the feeding ratchet wheel—also, admitting of the frictional bite of said wheel and roller being established or broken with facility, without interfering with the motion of the ratchet and gear therewith of the actuating pawl or pawls."

63. For *Improvements in Rotary Steam Engines;* Alfred Arnold, City of New York.

Claim.—"1st, The beveled periphery of the wheel, whereby the steam expends its force on the forces of the notches while being divided and passed away from the resisting surface of the wheel. 2d, The steam chest with its several perforations. 3d, The combination of the valve and steam chest, with the wheel of a percussion engine, whereby the power of the engine may be decreased without decreasing the velocity and density of the steam applied."

64. For an *Improved Method of Bending several Pieces of Wood of unequal lengths at once;* Heman A. Barnard, Moline, Illinois.

Claim.—"Combining the clamp, or its equivalent, by which the timber is grasped and held with the strip of metal and the bending form."

65. For an *Improved Floor Plane;* Charles E. Barlow, Philadelphia, Pennsylvania.

Claim.—"The construction of a self-adjusting floor plane, with its handle or handles hinged to the stock."

66. For an *Improvement in Hand Corn Planters;* H. F. Batcheller, Sterling, Illinois.

Claim.—"The combination of the pressure slide and seed distributing roller, arranged and placed relatively with the seed box."

67. For an *Improvement in Mills for Reducing Substances;* Thomas Blanchard, Boston, Massachusetts.

Claim.—"The employment of two series of rotating shears, combined with each other and with a suitable hopper for the supply of the material to be reduced. Also, in combination with the two series of rotating shears for reducing substances, the two series of eccentric clearers."

68. For an *Improvement in the Manufacture of Artificial Skins;* John H. Browne, Abbey Mills, Romsey Hantz, England; patented in England, Nov. 18, 1853.

"This invention consists in employing the cuttings or other parts of hides and skins by reducing the same to pulp, and then by rollers or pressure to produce sheets."

Claim.—"The manufacture of artificial skins."

69. For a *Machine for Mining Coal, &c.;* C. A. Chamberlin, Alleghany City, Pa.

Claim.—"1st, The combination of chisel-edged cutters and oblique-edged cutters

applied to the cutter wheel. 2d, The construction and mode of fitting together the cutter wheel and the head in which its axle is supported, whereby the cutter wheel is supported and enabled to cut its way beyond its axis. 3d, The arrangement of the main frame, the carriage, and the cutter wheel."

70. For an *Improvement in Bedstead Fastenings;* Wm. Clark, Weymouth, Ohio.

Claim.—"The arrangement of the bolt with the head and finger, and washer, provided with the slot flanch in connexion with the jointed rails, which are provided with springs and pins."

71. For an *Improvement in Sugar and Cider Mills;* Hamilton J. Cox, Warren Co., Ohio.

Claim.—"The combination of the several parts of a grooved roller cider mill, and the several parts of a smooth roller sugar mill, forming a new combination of machinery for the purpose of grinding sugar cane and apples, the same being perfectly adapted to both without alteration."

72. For an *Improvement in Billiard Table Tops or Beds;* Charles Croley, Cincinnati, Ohio.

Claim.—"Constructing the bed of billiard tables with the grain of the wood at right angles with the surface of the bed, and confining the bed to the frame of the table, with the cross-bars, screws, and blocks of wood, for the purpose of allowing the bed to expand and contract without becoming untrue."

73. For an *Improved Meat Cutter;* Abner B. Davenport, Petersham, Massachusetts.

Claim.—"The combination of the cam-wheel, spring, knife, and reciprocating tray."

74. For an *Improvement in the Mode of Tightening and Securing the Keys of the Journal Boxes of Connecting Rods or Pitmen;* Levi Dederick, Albany, N. Y.

Claim.—"The application of springs to act upon the tightening keys of the journal boxes of connecting rods and pitmen."

75. For an *Improvement in Seed Planters;* Wm. C. Doss, Texana, Texas.

Claim.—"The cylinder provided with the cups and fingers, in combination with the cylinder, and with obliquely set paddles."

76. For an *Improved Machine for Fitting Wagon Tires;* Edward L. Dorsey, Johnson Co., Indiana.

Claim.—"The arrangement of the wheels with the wheel, hand, and spring slide."

77. For an *Improvement in Lubricating the Axle Boxes of Carriage Wheels;* Wm. Diller, Lancaster, Pennsylvania.

Claim.—"The oblique or inclined grooves or oil chambers, formed within the axle box."

78. For an *Improvement in Corn Huskers;* Joseph and James L. Fagan, San Antonio River, Texas.

Claim.—"The rotating wheel provided with spurs or projections, and with cutters actuated by the cams, or their equivalents, in combination with the stationary and movable concaves."

79. For an *Improvement in Repeating Fire Arms;* A. C. Faivre, Meadville, Penna.

Claim.—"1st, The screw valve or cut-off, in combination with the lever and cover. 2d, The concave with the ball chamber and the powder chamber, in combination with the lever and ramrod. 3d, The cylinder, constructed with the charge chamber and ball tube, in combination with the box and the concave."

80. For an *Improvement in Machinery for Manufacturing Plaited Cord;* Charles Feickert, City of New York.

Claim.—"1st, The construction of the strand spindles, whereby the operations of twisting together the threads to form the strands, and the covering or plaiting of the strands, are performed simultaneously, and by the same rotary motion, and a uniform twist thus given to the threads of the body and of the plaiting or covering. 2d, The regulators, applied between the strand spindles and the laying spindles. 3d, The arrangement of the strand spindles, the laying spindles, and the rollers, or other equivalent, for laying the strands."

81. For an *Improvement in Splice for Joints of Railroad Rails;* M. Fisher, Trenton, New Jersey.

Claim.—"The combination of the sole piece, fore-locks, and bolt or bolts, for splicing the ends of rails on railroads."

82. For an *Improved Pin Sticking Machine;* Thaddeus Fowler, Waterbury, Conn.

Claim.—"The combination of the lateral feeding motion of the paper with the longitudinal feeding motion of the paper. Also, the method of taking the pins from the conductor, in combination with the method of inserting them one at a time into the crimped paper."

83. For an *Improvement in Machines for Hulling Rice;* A. M. George, Nashua, N. H.

"My invention consists in the employment or use of a hulling device and fan, whereby the grain will be perfectly hulled and winnowed."

Claim.—"The arrangement of the conical head, shell, fan, and annular blast or wind chamber."

84. For an *Improvement in "Fifth Wheel" for Vehicles;* H. T. Goodale, Clinton, Mass.

Claim.—"The arrangement of the reach with a groove to receive a screw, in combination with the conical shell or cap, and projection connected by bolt."

85. For an *Improvement in Grinding Mills;* R. D. Granger, Philadelphia, Penna.

Claim.—"1st, So constructing grinding mills having any convenient number of annular, concentric grinding cones, that each cone shall have its own hopper communicating with the general hopper, and its own set of feed openings. 2d, The combination of the bridge-tree, as secured to the shell, the bur shaft with its pinion, and the shaft with its wheel, when each is arranged in relation to the other."

86. For an *Improved Curtain Fixture;* Joseph F. Hall, Bangor, Maine.

"This invention consists in the adaptation of a cap-piece over the pulley at one end of the roller, which shall have the effect simultaneously to cover the pulley as a protection against dust and injury, and guide the cord from getting out of place, and also to act as a spring bearing against said pulley to hold it in position."

Claim.—"The combination of the spring and pulley."

87. For an *Improvement in Machines for Cutting and Crushing Corn Stalks;* Henry and Amos Hersh, Lancaster Co., Pennsylvania.

Claim.—"1st, The peculiar shape of the knives located at top of cylinder, and attached to the arms of the shaft, for the purpose of cutting off the ends of corn stalks by a circular sweep and an angular downward cut at the same operation. 2d, The combination of the knives as curved to correspond with the cylinder at top, and its spiral set teeth at the sides, for the purpose of cutting and crushing the corn stalk at one operation most effectually and in the simplest manner."

88. For an *Improvement in Stump Extractors;* Washington Hall, Brewer, Maine.

Claim.—"The combined arrangement of the simple levers, having their fulcrum in the windlass axle, with the ratchets, actuating and retaining pawls, axle and frame work, the whole so constructed and operating as to form a cheap and effective machine."

89. For an *Improvement in Ploughs;* David Hoke, Byhalia, Mississippi.

Claim.—"The arrangement of the cutter, in combination with the stock and beam. Also, the mode of constructing the stock with a long horizontal flanch, by which it is not only secured to the beam, but by which the coulter is held back against the foot of the stock."

90. For an *Improved Lock;* Abraham Hoagland, Jersey City, New Jersey.

Claim.—"The combination of the several parts to form a catch lock, with a separate key-hole on each side, having the bolt operated by the segments and the spring."

91. For a *Machine for Excavating Post Holes;* Wm. K. Johnston, Rock Island, Ill.

Claim.—"The arrangement of the pinion, the gate, the wheel, and the cogged bar, carrying the half nut."

92. For an *Improved Field-Fence;* John H. Jones and N. W. Smith, Lebanon, Ohio.

Claim.—"The means of uniting the panels by projecting one-half of the bars from each end of the panel, and one-half of their length into the adjoining panel between the battens, and connecting them together with pins, or otherwise, which mode of uniting the panels dispenses with the lapping and double battens."

93. For an *Improvement in Attaching the Springs of Vehicles;* F. L. Kidder and A. E. Aeby, Brooklyn, New York.

Claim.—"So arranging and connecting the springs of four-wheeled vehicles with the body and axles, so that the draft transmitted from the bolster longitudinally through the springs to their points of connexion with the body of the vehicle at each side, and thence in like manner through the hind springs to the hind axle shall form a direct line of draft on each side of the body from the front to the rear axle, thus dispensing with the necessity of the ordinary perch and braces to support the axles, using for this purpose the 'ogee,' or such other form of spring as will accomplish the object."

94. For an *Improved Safety Apparatus for Steam Boilers;* Wm. K. Hall, West Hoboken, New Jersey; patented in England Nov. 12, 1855.

Claim.—"The combination of a valve, fusible metal, and intervening elastic substances, and a pipe leading from the lower part of the boiler, by which the water may first be discharged from a boiler when dangerously over-heated, and employed if desired to extinguish the fire."

95. For an *Improvement in Machinery for Polishing Glass, &c.;* Alexander Lindsay, Malone, New York.

Claim.—"The arrangement of the grinders or polishers, whereby they are caused to derive a compound rotary motion, by the friction produced upon them by the rotary motion of the surface or surfaces to be ground or polished, or what is equivalent, the reverse arrangement, by which the surface or surfaces to be ground or polished are caused to derive a similar compound rotary motion by the friction produced by a rotary motion of the grinding or polishing surface."

96. For an *Improved Safety-valve;* Wm. H. Low, Albany, New York.

Claim.—"1st, The combination of the 'double beat valve' with the seat and weight, when arranged in relation to the passages. 2d, The combination of the double beat valve with the handle, casing, pin, and slotted hole."

97. For an *Improvement in Cotton Presses;* Josephus Loving, Moscow, Tennessee.

Claim.—"The peculiar means employed for operating the follower, to wit: the crossed levers, in combination with the rollers attached respectively to the follower bar and straps."

98. For an *Improvement in Machine for Packing Flour;* Judson Mattison, Oswego, New York.

Claim.—"As a protection to the sack or barrel to be packed, a stationary or movable cylinder containing a screw, or some other packing apparatus, arranged to work within said cylinder, and force the flour, or other substance to be packed, out of said cylinder, and pack it into the sack or barrel that surrounds it. Also, a traversing or yielding platform, so constructed and arranged as to hold the sack or barrel up around the cylinder containing the packer, and yield as the sack or barrel is filled with packed flour, or other substance being packed by the machine. And in combination with the traversing platform, one or a series of weights, arranged so as to counterbalance the weight of the material being packed on the platform, so as to pack the flour or other substance uniformly from the bottom to the top of the sack or barrel."

99. For an *Improvement in Constructing Framing of Bridges;* Wm. McKibbin, San Francisco, California.

Claim.—"The combination of the slotted lugs on the ends of the bars, the slotted plates, and the wedges or keys."

100. For an *Improvement in Mode of Operating Brakes of Railroad Cars;* Melville McGee, Jackson, Michigan.

Claim.—"The compound adjustable link, in combination with the device upon the locomotive for operating the brakes."

101. For an *Improvement in the Manufacture of Gas;* David C. Knab, Paris, France; patented in France, March 30, 1849.

"My invention consists principally in the peculiar construction and operation of carbonizing furnaces and other appurtenances."

Claim.—"The manufacture of gas and of coke, and other secondary products in furnaces."

102. For an *Improvement in Skirt Supporters;* N. C. Nelson, Concord, N. H.

Claim.—"The projecting out or flaring of the lower edge of the frame of the waist-band, or of pieces attached to it (making the waist-band shaped like the natural waist), in order that the skirts may be supported not by hooking, buttoning, or tying them to the supporter waist-band, but by simply putting the skirt waist-bands about the supporter waist-band in the same manner as they are put about the waist when no supporter is used."

103. For an *Improvement in Snow Ploughs;* Joseph H. Pawling, Philadelphia, Pa.

Claim.—"1st, The arrangement by which the cutters are made to revolve upon their axis, and by which the movement of the truck in following the direction and curves of the rails is so communicated to the cutters, and brings their edges, and causes them to act always in the direction in which the plough is moving. 2d, The arrangement of the scrapers by which they can be elevated and depressed at pleasure, so as to be kept clear of the rails when the train is backing, and thus prevented from catching in the joints of the rails, and can be pressed against the rails when the train is moving forward at the will of the operator."

104. For a *Mode of Attaching Metallic Letter-boxes to Lamp Posts;* Albert Potts, Philadelphia, Pennsylvania.

Claim.—"The combination of letter-boxes to lamp posts, by making the letter-boxes (metallic) with a perforation or socket through the centre or side thereof, so as to slide over and embrace the shaft of the ordinary cast iron lamp post."

105. For an *Improvement in Seed Planters;* Joseph Redhead, Woodville, Mississippi.

Claim.—"1st, The seed distributor, hung upon hinged arms, and agitated for the purpose of sifting the seeds through the opening or openings in its bottom. 2d, A supply seed box, rocking or oscillating on its supports as an auxiliary in furnishing the distributor with seeds, without so over-charging said distributor as to cause the seed to choke or clog therein."

106. For an *Improvement in Rotary Pumps,* Wm. Pierce, New Orleans, Louisiana.

Claim.—"The united blades whose amplitude of motion is limited by shoulders of the opposite blade, in combination with the projection in filling the space between rim and centre-piece."

107. For an *Improvement in Spring Seats of Chairs, Sofas, &c.;* Charles Robinson, Cambridgeport, Massachusetts.

Claim.—"The hinged supporting blocks and their projecting arms, connected by a band or bands."

108. For an *Improvement in Enameling Leather;* John Rose, Newark, New Jersey.

"My invention consists in the use of common salt, ammonia, and Canada balsam, in addition to other ingredients in common use, for the purpose of making enameled leather of a better quality, by applying the enamel at a low temperature, thus avoiding the use of ovens and the evils attendant thereupon."

Claim.—"The process of enameling leather described."

109. For an *Improvement in Cultivators;* D. B., Seymour and Leuman Rogers, Pittsburgh, Pennsylvania.

Claim.—"The combination of teeth, braces, standards, spring clamp, and gauge irons, with the frame of a cultivator."

110. For an *Improvement in Clothing for Carding Cylinders;* C. G. Sargent and F. A. Calvert, Lowell, Massachusetts.

Claim.—"The method of making clothing for burring and carding cylinders, the teeth being formed upon flattened wire, and bent at right angles to the plane of the strip of metal which sustains them."

111. For an *Improvement in the Mode of Producing Vertical and Horizontal Reciprocating Motion;* Matthias Steigers, St. Louis, Missouri.

Claim.—"So arranging and combining a series of eccentrics, or their equivalents, as to communicate to machinery a reciprocating motion in a vertical and horizontal direction at one and the same time."

112. For an *Improvement in Grinding Mills;* Gelston Sanford, Poughkeepsie, N. Y.

Claim.—"Giving the edges of the plates, having a longitudinal and lateral motion with reference to each other, the notch form, or its equivalent, by which the breaking of the coarser particles and their introduction between the plates is insured."

113. For an *Improved Window Fastener;* E. S. Scripture, New Haven, Connecticut.

Claim.—"The vibrating tracer (or in other words, the small section of a screw-nut allowed to be vibratory in its operation), in combination with the elastic pillow block, the regulating block, the bolt, and the catch stud, with their flanches and inclined planes, all being secured in a two part tube."

114. For *Improved Mathematical Dividers;* Anton Schæfer, City of New York.

Claim.—"The application and use of a parallelogram to dividers."

115. For an *Improvement in Harvesters;* Henry C. Smith, Cleveland, Ohio.

Claim.—"The manner of raising and lowering the cutter bar by the combined action of the levers, the flexible rod or cord, lever and wheel—this I claim when constructed and relatively arranged and operating, and also when used in connexion with the drag bars articulating upon the axle."

116. For an *Improvement in Hot Air Radiators;* Thomas T. Tasker, Philadelphia, Pa.

Claim.—"The mode of securing together the several divisions or systems of radiator tubes, the same consisting in the employment of the four terminal sections to each division, the whole being held together by the through bolts, thereby affording great facility in setting up the radiators and in taking them apart."

117. For an *Improvement in Iron Pavements;* Abijah R. Tewkesbury, East Boston, Massachusetts.

Claim.—"The improved cast iron pavement block, as made with an arched cap and two wedge-shaped prongs."

118. For an *Improved Life-preserver Raft of Buoyant Mattresses;* W. Urquhart, City of New York.

Claim.—"Providing the mattresses of a ship with straps and buckles on their upper and under surfaces, and with loops round their edges, whereby in case of emergency a series of mattresses can be buckled together, and a life-preserving raft formed by placing several layers or tiers of the mattresses thus buckled together on top of one another in a manner to form angular break joints, and said layers or tiers, thus arranged, readily and conveniently strapped together in such a manner that it will be impossible for the tiers to separate or change their position longitudinally or laterally."

119. For an *Improved Valve for Steam Engines;* Isaac Van Doren, Somerville, N. J.

Claim.—"A valve having the steam chest in its centre, but such steam chest so constructed that the steam shall not press against the valve, and also having the exhaust chamber between its outer and inner shells."

120. For an *Improved Bench Hook;* Edwin B. White, Nashua, New Hampshire.

Claim.—"Securing the hook at the desired height by means of the lever attached to the shell or case, and operated or adjusted by the screw, or its equivalent, so that the shank of the hook will be pressed against, both at its upper and lower ends, and thereby firmly secured within the shell or case."

121. For an *Improved Carpet Stretcher;* Joseph Warner, New Britain, Connecticut.

Claim.—"The lever of any proper form or shape, provided at one end with teeth, and pivoted to a plate having spurs attached."

122. For an *Improvement in Trenching Plough;* Wm. Wise, Washington, D. C.

Claim.—"The combination of the auxiliary share with the plough. Also, the combination of the guide bar with the plough."

123. For an *Improvement in Cotton Gins;* Francis L. Wilkinson, Adams' Run, S. C.

Claim.—"The arrangement of the spirally grooved rollers, one or both, stripping brushes, and plate."

124. For an *Improvement in Railroad Car Brakes;* Stephen M. Whipple, North Adams, Massachusetts.

Claim.—"The combination of levers, pulleys, and chains, by which a brakeman on the rear end of the last car of the train is enabled to brake the train."

125. For an *Improvement in Machines for Picking Fibrous Materials;* Oliver Woodworth, Jr., and J. D. Page, East Hartford, Connecticut.

Claim.—"The combination of two or more conical cylinders having teeth placed spirally around them at proper intervals, and within a suitable case, having teeth arranged in such manner as to allow the teeth in the cylinders to pass between them."

126. For an *Improvement in Steam Boilers;* Joseph Wood and H. N. Winans, Jersey City, New Jersey.

Claim.—"The interposition of the diaphragm reflector between the flues and the exhaust, for the purpose of protecting the exhaust from the draft, and for reflecting the heat back to the head."

127. For an *Improvement in the Construction of Military Drums;* Charles M. Zimmermann, Philadelphia, Pennsylvania.

Claim.—"Arranging and adapting a series of pulleys to the sides of drum hoops."

128. For an *Improvement in Corn Shellers;* Daniel G. Greene, Assignor to self and George H. Greene, North Bridgewater, Massachusetts.

Claim.—"The arrangement of the single tapering roll, concave shells, slots, springs, and spout, whereby the ear of corn is always kept in a horizontal position, and the cob is prevented from being forced diagonally under the roll, and is thus saved from being crushed or broken, together with other advantages."

129. For an *Improved Method of Generating Steam in Combination with Atmospheric Air as a Motive Power;* James Black, Assignor to Scott, Todd & Co., Philadelphia, Pennsylvania.

Claim.—"Generating a vapor or gas for mechanical purposes, by injecting into a suitable heated vessel or generator, a mixture of atmospheric air and water."

130. For an *Improvement in Dress of Stones for Hulling Mills;* David Collins, Assignor to self and W. L. Hanford, Jersey City, New Jersey.

Claim.—"The runner stone dressed with the radial polygonal furrows, when combined with the bed stone having radial furrows and straight furrows, or their equivalents."

131. For an *Improvement in Attaching Tools to Handles;* John Henn, New Britain, Assignor to self, Anton Daniel and Leopold Lankan, Hartford, Connecticut.

Claim.—"The arrangement and construction of the plate, with projection, acting against a spring in the back of a handle, in such manner that when opened it will relieve said spring to allow a knife or tool to be attached to the upper end of said handle, and when closed force the spring against the tool so as to hold the same perfectly steady in the handle."

132. For an *Improved Device for Pentagraphic Engraving Machines;* John Hope, Assignor to self and Thomas Hope, Providence, Rhode Island.

Claim.—"In combination with the main tracer of a pentagraphic engraving machine, a grooved tablet, or its equivalent, and an arm, and a secondary tracer or guide, to run or work in the grooves of the tablet, and to govern the direction of the movements of the main tracer in producing the ground lines of the engraved figures. Also, combining with the tracer the rest, so as to operate therewith."

133. For an *Improved Match Machine;* Samuel Miller, Hammond, and Wm. Gates, Jr., Frankfort, New York, Assignors to Wm. Gates, Jr., aforesaid.

Claim.—"Operating or moving the chain of clamps intermittingly, retaining it during the proper dwells, and opening the clamps during said dwells by means of the cams. Further, the guide, fitted in the gate, and used in connexion with the grooved bar, for the purpose of guiding the match sticks or causing them to be properly presented to the clamps. Also, the bar with or without the guide, when said bar is used in connexion with the cutting tool, for the purpose of retaining the bolt in proper position as the cutting tool ascends."

134. For an *Improved Washing Machine;* Henry Lawrence, Assignor to self and J. M. Connel, Newark, Ohio.

Claim.—"The combination of the stationary clothes' holder with the oscillating box and flexible rubbing system connected therewith, and made to pass over the said frame."

135. For an *Improvement in Raising Dough;* James Perry and Elisha Fitzgerald, Assignors to James Perry, Daniel Fitzgerald, and Horatio Bogart, City of New York.

Claim.—"The process of preparing dough or paste for making bread, cakes, or other farinaceous articles of food, by mixing the materials with gas under pressure in a closed vessel, as a means of leavening or raising the same. Also, discharging the dough from the vessel by the gaseous pressure, as it is required."

136. For a *Machine for Pricking and Cutting Heels of Boots and Shoes;* Edward S. Snell, Assignor to self and Francis B. Washburn, North Bridgewater, Mass.

Claim.—"The arrangement of devices for pricking the holes in boot and shoe heels, the same consisting of the block, furnished with a series of awls, the plate, and a pattern or bed-piece upon which the heel is placed. Also, the cutting apparatus, consisting of a knife so arranged upon a sliding carriage as to keep up the pattern, and furnished with a wheel that travels on the pattern in front of the knife, to adapt the knife to short curves in heels, whereby a heel is formed and pricked accurately."

137. For an *Improvement in Sewing Machines;* Charles Raymond, Assignor to Willford H. Nettleton, Bristol, Connecticut.

Claim.—"1st, The combination of the thread guide, clamping surface, and the eye, on the upper end of the needle bar, when said thread guide is fitted to move with the needle bar and regulated by the stop, or its equivalent, so as to measure off the amount of thread for each stitch. 2d, A stationary double inclined spreading plate, over the sides of which the loop is drawn and spread, when combined with a looping point to direct the loop of needle thread to said spreading plate as it draws up."

138. For an *Improvement in Ink-stands;* Lucien E. Hicks, Boston, Massachusetts, Assignor to David C. Field, Brooklyn, New York.

Claim.—"The employment of the bottom of a flexible ink-stand, for the purpose of serving as a valve in its use with the tube."

139. For an *Apparatus for Containing and Igniting Cigar Lighting Cinders;* Henrich Reimann, Hartford, Connecticut.

"This invention consists in the peculiar construction of several parts of said box."

Claim.—"The combination of the conveyor and ring, with the toothed edge and the toothed ring."

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140. For an *Improved Latch for Doors;* Thomas C. Ball, Keene, New Hampshire.

"This invention consists in a certain arrangement of the handle and latch, by which sliding doors may be closed and latched, or unlatched and opened, by a single effort of the hand exerted upon the handle, and by which, with the aid of a padlock, the latch may be firmly held in place and the door securely fastened."

Claim.—"The combination of the latch, the handle, the lever, the spring, and lock seat, or their equivalents."

141. For an *Improvement in Grain Winnowers;* H. H. Beach, Philadelphia, Penna.

Claim.—"1st, The bottom delivery board, having one or more series of fingers at the lower end, when the same is vibrated in a vertical direction, the blast of air from the fan acting upon the fingers. 2d, The combination of the series of inclined planes with the shoe and fingers, when arranged in relation to each other and the cover and partition, for the purpose of deflecting the blast of air from the fan, and directing it through the riddle and through the fingers."

142. For an *Improvement in Ventilating Hats;* James W. Beebe, City of New York.

Claim.—"Making the sweat of leather, or any of the equivalent substances usually employed for hat sweats, with a flanch pierced with numerous small holes, combined with, and attached to, the brim of the hat, so as to leave open space for the free circulation of air between the sweat and the hat."

143. For an *Improvement in Seed Drills;* C. B. Brown, Alton, Illinois.

Claim.—"1st, The employment of vertical, vibrating, serrated blades, in combination with the slitted flanched or serrated drill teeth. 2d, The combination of the seed distributor and clearing blades and propelling axle, by means of a double-acting rock shaft, three connecting rods, two elbow levers, crank shaft, and transverse slide, and two spur-wheels."

144. For an *Improved Life-preserving Buoy;* Benjamin Burling, Buffalo, New York.

Claim.—"The general arrangement of parts and conveniences, constituting a life and treasure preserving buoy."

145. For an *Improved Machine for Planing Blind Slats;* Charles Carlisle and Leonard Worcester, Woodstock, Vermont.

Claim.—"In combination with the matrice, the tilting frames, the planing cylinders, and the knives."

146. For an *Improved Joiners' Beveling Plane;* Thomas A. Chandler, Rockford, Ill.

Claim.—"Making one or both plane stocks adjustable on the arms or shanks of the hinges, so as to plane bevels of the same angle in boards of various thicknesses."

147. For *Improvements in Steam Boilers;* Abner Clark, Fort Des Moines, Iowa.

Claim.—"A steam boiler having its walls, tubular water and steam spaces, the cylindrical steam chamber, tubes, connecting elbows, and feed-water pipes and boxes, all arranged and combined."

148. For an *Improved Vise;* Charles B. Clark, Oriskanny Falls, New York.

Claim.—"1st, The arrangement and combination of the bar, screw-rod (having a thread), and pawl, the latter serving the double purpose of a pawl and nut. 2d, Providing the bar with recesses, so that the jaw may adjust itself or turn upon its pivot."

149. For an *Improvement in Calender Rolls;* Gardner G. Clark, Providence, R. I.

Claim.—"As a new article of manufacture, a calender roll, with its working surface formed of animal hair."

150. For an *Improvement in Mounting Fluid Lenses;* A. M. Cole, Windham, Maine.

"This invention consists in providing a fluid lens with a shade, and placing said lens and shade between two upright studs, and made to slide with ease upon the same, for the purpose of elevating and depressing the shade and lens to conform to the different height of tapers that may be placed in the rear of the lens."

Claim.—"The appendage to the shade of a fluid lens, a woman's sewing utensils."

151. For an *Improvement in the Manufacture of Textile Hose;* Linas B. Cooley and James C. Cooke, Middletown, Connecticut.

Claim.—"The double tube or hose as a new article of manufacture."

152. For an *Improvement in Photolithography;* J. A. Cutting and L. H. Bradford, Boston, Massachusetts.

Claim.—"The employment of gum arabic deprived of its power of intimate union with the stone, by means of sugar, or its equivalent. And, in combination with the above, the use of soap for the purpose of readily removing the unlighted portions of gum, and of forming the printing surface."

153. For an *Improved Roofing Cement;* Wm. P. DeGolyer, Schenectady, New York.

Claim.—"Combining an elastic basis, consisting of tar, canvas, and earthy matter, with a super-imposed coat of iron turnings filled in with earthy matter."

154. For an *Improved Lock;* Wm. Denney, Philadelphia, Pennsylvania.

Claim.—"1st, The employment of the lever in combination with tumblers. 2d, The combination of the detector with one of the tumblers. 3d, The employment of the supplementary key, for the purpose of releasing the bolt plate from the detector."

155. For an *Improved Separator and Smut Machine;* Daniel M. Donehoo, Hookstown, Pennsylvania.

Claim.—"1st, The arrangement of a horizontal flaring blast-spout, with a vertical spout furnished with sliding adjustable screening gates formed of wire gauze, and with

separating partitions, said spout also being arranged at right angles, or nearly so, to the horizon on the outer end of the blast-spout. 2d, The arrangement of a vibrating shoe when made with two reverse incline chutes, one of which is adjustable, and made of wire or perforated plate with the chute, and with the screening and separating spout, and the scouring cylinder. 3d, The employment of radially fluted scouring plates, when shaped on top in the form of truncated cones, in combination with radially fluted, stationary, concentric, prismatic rings. 4th, The particular arrangement of the screening and separating spout, blast-spout, fan with valves, double reverse incline cockle chute, peculiar scouring apparatus, and dust-spout."

156. For an *Improvement in Wrought Iron Girders;* Thomas G. Gaylord, Cincinnati, Ohio.

Claim.—"The duplex girder or beam, composed of an upper piece having the form of an inverted Y, and a lower piece having the form of an inverted T, whose stem or 'comb' is adapted to fit closely within the apex of the upper piece."

157. For an *Improvement in Cut Nail Machines;* G. C. Grodhaus, Jamestown, Ohio.

Claim.—"The arrangement of the sheath, the circular guide, and the fork bar, the said sheath having its upper end pivoted, and its lower end traveling upon a track, the circular guide extending from one set of cutters to the other, and the curve of its arc corresponding to the sweep of the lower end of the sheath, and the fork-bar being attached to, and carried by, the same bar which actuates the sheath."

158. For a *Life-preserving Float;* George W. Hamilton, Assignor to self and Oliver P. Bower, Watkins, New York.

"My invention is designed to combine the elements of a raft and life-boat, and is intended for use on steam and other passage vessels. It consists of an exterior metallic vessel of circular form and shallow depth."

Claim.—"A life-preserving float constructed with annular concentric chambers and air receivers, combined with the central ballast and radial braces and binding straps."

159. For an *Improvement in Seed Drills;* Robert Hamilton, Franklin, Indiana.

Claim.—"The peculiar arrangement of the circular bottom as prepared with the vibrating bar, pins, sides, lever, slide, and cam."

160. For an *Improved Washing Machine;* Lewis Hannum, Homer, New York.

Claim.—"The employment of the projections in the bottom of the tub, in combination with the knuckles on the under side of the disk."

161. For an *Improvement in Apparatus for Drying Fruit;* Wm. Heaton, Green Co., Pennsylvania.

Claim.—"The revolving or rotating drying reel, the drying sieves and pans, when used in arrangement with the casing, vents, flues, cells, register chimney, smoke flue, and vapor escapes."

162. For an *Improvement in Blow-Pipes;* Joseph Hollely, City of New York.

Claim.—"A blow-pipe provided with a faucet, spigot, and jet-pipes, in connexion with a safety-valve."

163. For an *Improvement in Grain Separators and Cleaners;* Simeon Howes, Silver Creek, New York, and Gardner E. Throop, Chicago, Illinois.

Claim.—"The combination of the tubes and the outer casing, when so constructed and arranged in connexion with the fan-case as to prevent the smut, &c., from coming in contact with the cleaned grain."

164. For a *Combined Floating Anchor and Life-preserver;* Joseph Humphries, Washington, D. C.

Claim.—"The floating drag or anchor composed of three parts hinged together, two of which parts are of solid wood, the other part containing receptacles for water and bread, when said drag is used as a life-preserver. Also, the arrangement of the bridle with the device for detaching the weight."

165. For an *Improvement in Attaching the Glasses of Vault Covers;* George R. Jackson, City of New York.

Claim.—"The tapering and grooved glasses, in combination with the tapering and grooved apertures in the metallic portions of said covers."

166. For an *Improved Mode of Operating Valves in Steam Engines;* T. S. Jamieson, Alexandria, Virginia.

Claim.—"In combination with the sliding bar and its several appliances, operated directly from the engine, the swinging dogs, which are moved and adjusted by the governor, for the purpose of tripping the valves at any desired stroke of the engine."

167. For an *Improved Holder for Planing Knives while Grinding;* Lyman Jennings, Erving, Massachusetts.

Claim.—"The frame provided with the rollers, one or more, and the plate, clamps, and adjusting screws, or their equivalents, for securing and adjusting the knife or cutter in the frame."

168. For an *Improved Apparatus for Regulating and Measuring the Intensity of Electric Currents;* Joseph Lacassagne and Rodolphe Thiers, Lyons, France.

Claim.—"Combining the application of the three principles specified, so as to form an apparatus for regulating and measuring the force or intensity of the electric current produced by any battery, and applicable to the telegraphing and motive purposes."

169. For an *Improvement in Grain Cradles;* John Leidy, Lamar, Pennsylvania.

"This invention consists in a new method of bracing and securing the fingers of grain cradles, so that they may be readily moved, and easily and quickly adjusted at any angle desired."

Claim.—"The arrangement of plate and its shank, with rods and screws."

170. For an *Improved Sawing Machine;* H. H. Low, Galena, Ilinois.

Claim.—"The vertically sliding and balanced bolt, gate, and saw, in combination with the feeding device formed of the bar, levers, pawls, and racks, the whole being arranged to act conjointly."

171. For an *Improvement in Picturetypes;* John McElheran, Brooklyn, New York.

Claim.—"The mode of preparing in the picturetypes to be printed from, granulated surfaces, producing various shades and effects."

172. For an *Improved Door Register;* John G. Miller, Swanton, Maryland.

Claim.—"The peculiar arrangement of the spools and shafts with the rollers and a canvas, in combination with the face of stationary inscriptions and the slate."

173. For an *Improvement in Spinning Bobbins;* Alfred E. Nichols, Lowell, Mass.

Claim.—"A slotted bobbin having a spring, or its equivalent, so applied to it as to impart increased adherence of the slotted portion to the spindle on which it is placed."

174. For an *Improved Milking Pail;* Solomon Oppenheimer, Peru, Indiana.

Claim.—"The pendent rod and lever bar when combined, and for the purpose of keeping the orifice on the milking pail open, when the same stands uninterrupted and in its proper position."

175. For an *Improvement in Spring Bedsteads;* Nathan M. Phillips, City of N. Y.

Claim.—"The combination of the cross-bars and the spiral springs, with the bottom bars and the flexible connexions."

176. For an *Improvement in Cooking Stoves;* Christian Raub, Davenport, Iowa.

Claim.—"The arrangement of the series of stoves fed by one central stack, and provided with one central smoke stack and a central water boiler."

177. For an *Improvement in Cooking Stoves;* Christian Raub, Davenport, Iowa.

Claim.—"The arrangement of the feeding trunk and its water chambers, in combination with the fire chamber, ovens, and flues, for the escape of the gases of combustion."

178. For an *Improvement in Gang Ploughs;* Lewis Roach, Covington, Kentucky.

Claim.—"The arrangement of spiral splines (to which the ploughs are attached,) and adjustable arms, in combination with the gravitating shaft and gauge wheels."

179. For an *Improved Washing Machine;* James Robb, Lewistown, Pennsylvania.

Claim.—"The combination of the open frame with the removable flexible casing."

180. For an *Improvement in Machines for Trimming Books;* A. C. Semple, City of New York.

Claim.—"Bringing the table or carriage which contains the books or paper to be cut to the knife, by moving it up an inclined plane."

181. For an *Improvement in Portable Gas Retorts;* J. W. Smith, Washington, D. C.

Claim.—"The combination of the horizontal retort with the casing, when the former is constructed with an open end, and so arranged in reference to the latter that a space shall be constantly left open for the passage of the gas between the retort and the casing."

182. For an *Improved Canal Boat Propeller;* George W. Swartz, Buffalo, N. Y.

Claim.—"The guard when arranged with a recess or chute. Also, the braces, for the purpose of strengthening the guard and supporting the propeller shaft."

183. For *Improvements in Preparing Silk for use with Felting Substances;* Anson Taylor, Brooklyn, New York.

"This invention consists in exposing silk fibres to sufficient heat to partially destroy their strength and tenacity, and render the same adapted to use with fur, wool, or other felting material, in the carding, picking, bowing, or blowing operations in preparing the fibrous material, and to the subsequent operations of shrinking, planking, and finishing the felted goods."

Claim.—"The method described of preparing silk fibres for use with fur, or other felting materials."

184. For an *Improvement in Ploughs;* Grey Utley, Louisburgh, North Carolina.

Claim.—"The combination of the vertically adjustable mould-board with the sub-soil point and the two land-sides."

185. For an *Improved Anchor;* Wm. Williams, St. Louis, Missouri.

Claim.—"The application of the separate block to the lower end of the anchor shank, and of hinging the flukes in the said block."

186. For an *Improvement in Sewing Machines;* Joseph E. Hendrick, Assignor to self and Wm. Holmes, Brooklyn, New York.

Claim.—"1st, A concentric rotary feeding pad, vibrating upon an axis which yields to pressure in an upward direction, giving a pressure upon the cloth which is entirely subject to the tension of the spring, or other device, by which the pad is forced down upon it, without being subjected to the action of a toggle-joint. 2d, The combination of an adjustable spring friction brake with a rotary thread carrier, consisting of the shaft, disk, and point or pins, or their equivalents."

187. For an *Improvement in Metallic Sash;* Charles Hartwell, Boston, Massachusetts, Assignor to Lewis L. Bartlett, Brooklyn, New York.

Claim.—"The construction and use of metallic sashes composed of two parts, so that one or both the parts may yield by its elasticity, in combination with an elastic bedding. Also, making the inner portion of the above described metallic sash with a groove."

188. For an *Improvement in Sewing Machines;* Sidney Parker, Assignor to self, Leonard Westbrook, and Hugh Herringshaw, City of New York.

Claim.—"The combination and arrangement of the horizontally, reciprocating, pronged looper, and the bobbin."

189. For an *Improvement in Dumping Boxes for Agricultural purposes;* John Van Doren, Farm Ridge, Assignor to self and B. Murray, Ottawa, Illinois.

Claim.—"The combination of the dumping boxes with the blocks and platform."

190. For an *Improvement in Let-off Motion for Power Looms;* Newell Wyllys, South Glastenburgh, Assignor to self and Charles Collins, Hartford, Connecticut.

Claim.—"1st, The employment of a movable cap, or its equivalent, as the bearing surface for the cloth on the breast beam of the loom, for the purpose of controlling the letting of the warp yarn from the yarn beam by the pressure of the cloth on the breast beam. 2d, In combination with the movable cap of the breast beam, or its equivalent, and a friction wheel and friction band applied to the yarn beam, the train of mechanism through which the said movable cap, or its equivalent, operates to control the tension of the friction band, for the purpose of controlling the tension of the warp yarn."

191. For an *Improvement in Sewing Machines;* Joshua Gray, Assignor to self and F. B. Mackay, Boston, Massachusetts.

Claim.—"1st, The arrangement of the adjustable slotted plate. 2d, The arrangement and combination of the double cam block with the looper."

192. For an *Arrangement of Devices for Lowering and Detaching Boats;* Henry De Neuve, Galveston, Texas.

Claim.—"The peculiar arrangement consisting of the chains or braces, central broad-headed bolt, and grapple hook, with the lowering tackle of a ship."

193. For an *Improved Process of Making Soap;* Campbell Morfit, Baltimore, Md.

Claim.—"The saponification of red oil or red acid oil and flat acids generally, by means of powdered or dry carbonate of soda, as kelp, trona, salsoda, soda ash, bi-carbonate of soda, &c., and converting them into toilet and laundry soaps."

194. For an *Improvement in Using Graphite in Reducing Metal;* Joseph Weisman, Philadelphia, Pennsylvania.

Claim.—"The use and mode of using graphite, plumbago or blacklead for the purpose set forth."

195. For an *Improvement in Steam Boilers;* Henry Whinfield, City of New York.

Claim.—"The arrangement of the longitudinal, latitudinal, or transverse and vertical fire tubes or flues."

196. For an *Improvement in Machine for Crushing Ore;* Nathaniel Conkling, Brooklyn, New York.

Claim.—"What I claim in the machine constructed with its circular trough arranged and made to revolve horizontally or thereabout, and each of the wheels applied thereto in such manner that it may be stationary with respect to said trough, except in being capable of revolving on its axis, and of rising up and down to accommodate itself to the ore in the trough during the revolution of said trough—is supporting each wheel by means of a rocker frame and guides applied to it and the main frame, or arranged therewith. Also, the arrangement of a deflecting scraper with respect to the inner surfaces of each wheel and the trough, and so as to operate as set forth."

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197. For an *Improvement in Pumps;* James B. Atwater, Brooklyn, New York.

Claim.—"The arrangement of the plunger and cylinder, with their respective enlarged portions."

198. For an *Improved Printing Press;* Henry A. Bills, West Winsted, Connecticut, and Stephen W. Wood, Cornwall, New York; patented in England, January 28, 1858.

Claim.—"1st, Setting a form of type upon flat rotating forms or beds in separate and independent columns, arranged alternately upon the peripheries of cylinders, with corresponding cylinder, upon whose peripheries are segments of impression cylinders. 2d, Grooving or notching type and keying them by independent keys to a bed or form."

199. For an *Improvement in Self-adjusting Door Sill;* George B. Bigelow, Worcester, Massachusetts.

Claim.—"Constructing a movable door sill that shall be level or even with the floor when the door is opened, and when it is closed shall be raised to form a close fit to the bottom of the door, by means of the spring levers."

200. For an *Improvement in Walking-stick Gun;* Robert R. Bickwith, City of N. Y.

Claim.—"The combination of the hammer, pin, sleeve, and the locking lever."

201. For an *Improvement in Railroad Rails;* Leverett Ball, Auburn, New York.

Claim.—"The use of plates inserted at the middle and ends of the sections of compound rails, in combination with said sections locked together throughout their whole length, thus binding the rail together like a solid continuous rail."

202. For an *Improvement in Securing the Wheels of Carriages, &c.;* Adolphus Bruns, Davenport, Iowa.

"This invention consists in providing each wheel of the vehicle with a separate re-

volving axle working on cast iron rollers, fastened by two cast iron plates on each side of the hub, and by two wood screws on each side of the plates."

Claim.—"Securing the wheels upon the independent revolving axle."

203. For an *Improvement in Casting Metallic Cheese Hoops;* Timothy Brown, Georgetown, New York.

Claim.—"The combination of the cylindrical, guiding, and supporting mould-piece, provided with the flanch bottom and side projections, the semi-cylindrical mould-piece, and the guide top, all arranged in relation to each other and united by the rods."

204. For an *Improved Self-adjusting Damper for Hot Air Furnaces;* Ebenezer Barrows, Jr., Brooklyn, New York.

"My invention consists in placing in the lower part of each hot air conducting pipe, a valve or damper hung on an axis in nearly an equilibrated state, so that when the register of the pipes is closed and the draft through them consequently stopped, the dampers will close by their own gravity, and shut off the pipes from the air heating chamber, and when the registers are fully, or more or less open, the dampers will be open to a corresponding degree by the action of the draft."

Claim.—"Placing the valve or damper in the lower part of the hot air conducting pipe, when said valve is so hung or arranged as to operate as described."

205. For an *Improvement in Cotton Gins;* Hiram W. Brown, Millville, New Jersey.

Claim.—"The roller, stripping plate, and pressure plate, in combination with the yielding or vibrating feed board or plate, provided with rods *o*, the rods *n*, and doffer *N*."

206. For an *Improvement in Oscillating Pumps;* Ezra Cope and I. W. Bragg, Cincinnati, Ohio.

Claim.—"The arrangement of two single-acting oscillating plunger pumps to oscillate upon a single trunnion placed between them, in combination with the employment and use of two or more induction ports in the one chamber of the trunnion, and two or more eduction ports in the other chamber of the trunnion, arranged to alternately communicate with corresponding ports or openings and passages in each cylinder."

207. For an *Improvement in Meat Choppers;* Plumer H. Chesley, Lynn, Mass.

Claim.—"The arrangement of the cogged wheel, the series of spring cutters, and cleaner, with each other."

208. For an *Improvement in Fire-proof Ceiling;* John B. Cornell, City of N. York.

Claim.—"My improved method of constructing fire-proof ceilings beneath wooden beams, viz: by suspending combined metallic lath sections beneath the aforesaid beams, and then coating said sections on both sides."

209. For an *Improvement in Hot Air Furnaces;* John Child, Elyria, Ohio.

Claim.—"The arrangement whereby I effect the gradual heating and an active circulation of air, by the arrangement of the horizontal prolonged passage surrounding the fire chamber and the rarifying chamber above the fire chamber."

210. For an *Improvement in Sewing Machines;* F. S. Coates, City of New York.

Claim.—"The combination of the spring with the feed and hook, for the purpose of expanding the loop in sewing machines."

211. For an *Improvement in the Mode of Connecting the Sections of Metallic Funnels;* John W. Cochran, City of New York.

Claim.—"In metallic funnels, the inclined arms attached to the ends of the sections, and the cople for securing and connecting the same."

212. For *Improvements in Method of Cleansing Gas Generators;* Saunders Coates, City of New York.

Claim.—"The mode of clearing the retort by the admission of atmospheric air at the top of said retort, in combination with the draft pipe for carrying off the products of combustion."

213. For an *Improved Binding Attachment to Reapers;* Aaron F. French, Franklin, Assignor to George I. Stannard, St. Albans, Vermont.

Claim.—"The revolving rake formed of the curved teeth, attached to the shaft—the

rods, curved so as to form the receptacles—and the elastic strips, connected with the lever frame—the above parts being combined and arranged to operate with or without the rod or bar."

214. For an *Improvement in Machine for Cutting the Leaves from the Sugar Cane preparatory to Grinding;* Calvin Dickey, Mercersburgh, Pennsylvania.

Claim.—"The cutting device formed of the cutters attached to a tubular flanch."

215. For an *Improvement in Hay-cock Protectors;* O. R. Dinsmoor, Auburn, N. H.

Claim.—"Combining with the cover, elastic ground connexion, and a centre pin, to extend into, but not through, the hay."

216. For an *Improvement in Regulators for Roving or Yarn;* Daniel Dermond, Philadelphia, Pennsylvania.

Claim.—"The combination of the pulley, the system of spur gearing, the shaft, the pulley, and enclosed box, with the ratchet and positive stop."

217. For an *Improvement in Hominy Mills;* Frederick E. Drake and J. W. Teal, Indianapolis, Indiana.

Claim.—"The combination and arrangement of the perforated disks with the fans."

218. For an *Improved Machine for Sawing Staves;* Harry H. Evarts, Chicago, Ill.

"This invention consists in so forming and arranging the saw and machinery as to enable me to saw the stave in the direction of the fibre of the wood, so that the saw cuts or planes the stave from the block, much as it would be done by a joiner's plough, yet so smoothly that the stave will need no further dressing."

Claim.—"The arrangement of the machinery as described."

219. For an *Improvement in Metallic Boats;* Joseph Francis, City of New York; patented in England, July 21, 1856.

Claim.—"Preparing sheets or plates of metal for forming boats with corrugations composed of a series of flat, or nearly flat, surfaces, united by a curved or nearly quarter circle corrugation. Also, the manner of varying the size and proportions of corrugated metallic boats made from sheets pressed in one size of die, by forming the corrugations near the centre parallel, or nearly so, and increasing or decreasing the number of central plates formed with such corrugations."

220. For an *Improved Water-tight Wash-stand;* Christian Gies, City of New York.

Claim.—"1st, The raised flanch, ridge, elevation or projection upon the basin, in combination with the counter-sunk marble slab, to fit such flanch. 2d, The cap-like attachment upon the faucet, fitting closely over the projection upon the marble slab, through which the faucet passes."

221. For an *Improvement in Roofing Cement Composition;* Robert Glennon, New Orleans, Louisiana.

Claim.—"The composition made up of the ingredients."

NOTE.—The aforesaid ingredients are spirits of turpentine, Vandyke brown, alcohol, gum shellac, linseed oil, oil of amber, Japan varnish, sulphate of zinc, and coal tar.

222. For an *Improved Grinding Attachment to Pug-mills;* David H. Gage, Dover, New Hampshire.

Claim.—"The combination of the double series of rotating arms with the stationary arms and the dish-shaped grinder, when the said parts are so shaped as to operate in conjunction with each other."

223. For an *Improvement in Rotary Steam Engines;* James B. Groomes, Carmichaels, Pennsylvania.

Claim.—"The flanched cylinders encasing the shaft at its transverse perforations, and packed between the flanches and the cylinder heads, in combination with the steam channels of the shaft, and the induction and eduction pipes communicating with the annular spaces between the flanches of the cylinders."

224. For an *Improvement in Ribbon Looms;* Wm. J. Horstmann, Philadelphia, Pa.

Claim.—"The bent rod passing between the two headings of the trimmings or fringes, and forming a back or edge over which the filling is worked."

225. For an *Improvement in Pumps;* Jacob O. Joyce, Cincinnati, Ohio.

Claim.—"The arrangement of the circular chambers, having their valves operated with the wedge valve and its inlet and exit openings."

226. For an *Improvement in Holding-bolt for Carpenters' Brackets, &c.;* John W. Kennedy, Plainfield, Connecticut.

Claim.—"The spiral pointed dog or pawl, as used with the bolt to hold and secure carpenters' brackets for fasteners to buildings."

227. For *Improvements in Dyeing Yarn Parti-colored;* David B. Kerr, City of N. Y.

Claim.—"The method of arranging yarn in folds or loops of greater or less length as a figure may require, previous to the application of the dye. Also, the method of folding yarn, in combination with the clamping of the same previous to the application of the dye, so as to preserve the integrity of the folds or loops. Also, the method of parti-coloring yarn by submitting it while clamped in folded loops of greater or less length, to the action of the dye."

228. For an *Improved Method of Clamping Polygonal Pieces in Planing Machines;* Joseph W. Killam, East Wilton, New Hampshire.

Claim.—"The triangular piece, the sliding piece, and the dog, in combination with each other."

229. For an *Improvement in Harvesters;* J. M. Long, Peter Black, and Robert Allstatter, Hamilton, Ohio.

Claim.—"1st, The combination of lever box, guide piece, and short axle, with nut and screw. 2d, The stay-rod, in combination with the bar. 3d, Supporting the rear of the platform by suspension from the stay-rod."

230. For an *Improvement in Superstructure of Railways;* Stephen H. Long, U. S. A., Louisville, Kentucky.

Claim.—"The combination of grade plates and ribbed sills. Also, bolting the rail to the sill through the grade plates, in such manner as that the expansion and contraction (or creeping as it is termed) of the rails shall not be communicated to the grade plates, which allows said plates to retain their position regardless of the moving of the rails."

231. For an *Improvement in Railroad Car Couplings;* Henry E. Loane, Baltimore, Maryland.

Claim.—"The arrangement and combination of the coupling bar, jaws, and holding plate in the open mouthed coupling heads."

232. For an *Improvement in Ploughs;* Thomas McConaughy, Burnsville, Alabama.

Claim.—"Extending the piece, to which the point is secured, rearward a distance nearly equal to its height, and giving it increasing lower flanches at bottom, said piece being formed with thick bounding edges, and a thin plate filling the intermediate space."

233. For an *Improvement in Graphotype;* John McElheran, Brooklyn, New York.

Claim.—"The method of producing the mould or matrix, wherein the metal is deposited by electric action to form picturetypes, or their equivalents, of wax, applied to, and in combination with, a hard, transparent, smooth, and level plate."

234. For an *Improvement in Presses for Extracting Oil from Linseed;* C. Moore, Trenton, New Jersey.

Claim.—"The combination of the grooved plates with the hair padding, or such other as may be used, fastened to the plates of the press, with its edges made thicker than the body of the padding. Also, connecting the upper plate to the top of the press by links or staples and pins, and the plates to one another by links and pins, so arranged that the plates may be pressed together without cramping the links by which they are connected."

235. For an *Improvement in Cotton Bale Ties;* D. G. Olmstead, Vicksburgh, Miss.

Claim.—"The clasp and wedge, arranged and operating in combination with the band, with its bent extremities."

236. For an *Improvement in Compounds for Hardening Iron and Steel;* Charles Pauvert, Targé, France.

"I employ a cementing substance composed of the following ingredients and pro-

portions: 33 parts of very finely powdered charcoal; 33 of highly aluminous clay; 33 of carbonate of lime or wood ashes; 1 carbonate of soda, and 1 carbonate of potash."

Claim.—"The use of the ingredients herein described."

237. For an *Improved Machine for Turning Tool Handles, &c.;* Hiram Plumb, Honesdale, Pennsylvania.

Claim.—"The employment of cutter, socket, forming cutter, pattern, finishing cutter and stops combined."

238. For an *Improvement in Cement Composition for Roofing;* Bradley L. Prime, Hamilton, Ohio.

"The composition is made up of the following ingredients in substantially the proportions stated:—coal tar, 1½ gals.; vegetable tar, ½ lb.; brimstone, 12 oz.; asphaltum, 6 oz.; india rubber, 1½ lbs.; gutta-percha, 1 oz.; gum copal, 2 oz.; red oxide of lead, 8 oz.; red lead, 8 oz.; umber, 8 oz.; Spanish whiting, 16 oz.; hydraulic cement, 4 oz.; Japan varnish, ½-pint."

Claim.—"The combination of the substances herein described in the proportions set forth."

239. For an *Improved Stove Heating Apparatus;* David S. Quimby, Brooklyn, N. Y.

Claim.—"The arrangement of the heating chamber provided with deflecting plates and apertures in the top plate, with the cold air flue, in connexion with the stove or furnace."

240. For an *Improvement in Cotton Presses;* Hiram Ross, Rockport, Indiana.

Claim.—"The toggles, in combination with the lever, provided with the semicircular projection, and connected with the toggles by cords or chains."

241. For an *Improvement in Revolving Cylinder Steam Engines;* Thomas Rogers, Philadelphia, Pennsylvania.

Claim.—"The two L shaped stationary hollow steam heads, applied and arranged to constitute stationary journals for the two-hubbed drum or fly-wheel, and bearings for the cylinder journals, while they also constitute valves for the induction and eduction of the steam."

242. For an *Improvement in Corn Harvesters;* Thomas A. Risher, Circleville, Ohio.

Claim.—"The arrangement of the concave shocker, clamp lever, and rest, with relation to cutters, inclined arms, belt, and guide."

243. For an *Improvement in Cigar-lighting Cinders;* Henrich Reimann, Hartford, Connecticut.

Claim.—"The cigar-lighting cinder compounded and formed as described."

NOTE.—The above "cinder" is formed of nitre, wheat flour, phosphorus, calcined plaster, gum arabic, and gunpowder.

244. For an *Improvement in Turning and Sliding Tables for Railroads;* Wm. Sellers, Philadelphia, Pennsylvania.

Claim.—"Interposing the central part or box between the ends of the truss rail beams, in such manner as to make use of the width of said central part or box as a portion of the length of the said beams, and the said beams and central box are so constructed and connected as to form a table entirely supported from the central part or box."

245. For an *Improvement in Stop-motion for Hair Cloth Looms;* R. J. Stafford, Smithfield, Rhode Island.

Claim.—"The mode of operation, by means of which in case the hook, nippers, or other instrument used to insert the weft of the cloth, fails to seize and draw in any one hair, or other material intended, a disconnexion is in consequence effected between the gear that controls the action of the several sets of heddles and the source of motion, before the relative positions of the several sets of heddles to each other are shifted, and a new shed opened—while the other parts of the loom are permitted to continue in operation. Also, the mode of operation, by means of which the 'signal messenger,' during the backward beat of the lay, is returned to such a position that whenever the hair, or other material, is inserted between the threads of the warp, where it belongs, the gear which controls the action of the several sets of heddles is again put in motion. Also, the 'signal messenger.'"

246. For an *Improvement in Gas Burners;* Denis Sullivan and Michael McIntyre, Cincinnati, Ohio.

Claim.—"The construction and arrangement of the plug for regulating the flow of gas to any extent desired."

247. For an *Improvement in Tightening the Tires of Carriage Wheels;* Robert B. Scott, Philadelphia, Pennsylvania.

Claim.—"The end with its slotted lips, and the bent end with its slotted enlargement, in combination with the taper keys and bolt."

248. For an *Improvement in Pistons and Piston Rod Connexions;* A. V. Samuel, City of New York.

Claim.—"A direct connexion of the piston rod to the crank with a fixed cylinder, by the use or by means of the arrangement of the movable boxes in the piston, forming the connexion between the piston and piston rod, in combination or connexion with the part moving upon the curved covers of the cylinder."

249. For an *Improvement in Sewing Machines;* James and Amos W. Sangster, Buffalo, New York.

Claim.—"The looper, when the several parts thereof are constructed and arranged to operate in relation to each other, and to the needle and thread."

250. For an *Improved Post for Field-Fence;* Heber G. Seekins, Elyria, Ohio.

Claim.—"The foot-piece, having recess and lugs, in combination with the posts, said posts having apertures and recesses, said apertures and recesses being so positioned as to correspond with apertures and lugs of foot-piece."

251. For an *Improvement in Ploughs;* Daniel L. Tilton, Mt. Carmel, Illinois.

"This invention consists in a provision by which weeds, brush, &c., are completely covered in the act of ploughing."

Claim.—"The construction and arrangement of the tines."

252. For an *Improvement in Reciprocating and Rotary Motion;* Isaac Van Doren, Somerville, New Jersey.

Claim.—"The arrangement of the wheel and its elevation, and the carriage and its projection, so that the wheel shall be constantly rotated by the use of (elevation and projection) alone, without springs, sliding cogs, or any other mechanism."

253. For an *Improvement in Mill Bushes;* John Wells, Baltimore, Maryland.

Claim.—"The feathered spindle and recessed flanched collar resting upon plate, and cylindrical guide depending from the latter plate, when said parts are arranged for joint operation."

254. For an *Improvement in Meat Cutting Machines;* Frederick Wobfersberger, Salem Station, Ohio.

Claim.—"The segment plates arranged spirally on the roller between the pins, in combination with the knives."

255. For an *Improvement in Composition for Varnishes;* Damon R. Averill, Assignor to self and James F. Davis, Pulaski, New York.

Claim.—"The composition of matter, consisting of water and acetate of lead, with spirits of turpentine and coal tar, for the purpose of making a cheap, quickly drying, and superior varnish."

256. For an *Improved Shoe Peg Machine;* Amos H. Boyd, Assignor to Samuel F. Chase, Saco, Maine.

Claim.—"1st, The combination of the pointer, splitter, and intermittent feed of the block, operated conjointly. 2d, The construction and arrangement of the transversely or circumferentially grooved or threaded rollers, as a means of feeding and holding the block or bolt for pointing."

257. For an *Improvement in Steam Gauges;* Franz Burckle, Assignor to Edward H. Ashcroft, Boston, Massachusetts.

Claim.—"Supporting the upper end of the piston by the main spring, in combination with supporting the lower end of the said piston by a radial disk spring applied to it

and the elastic diaphragm—the same serving not only to centralize the piston during its movements, or maintain it in a straight path, and out of contact with the sides of the passage through which it plays, but to operate in other respects. Also, fastening the main spring at the middle part of its inferior half with the lower part of the box or case, and making the piston play through the fastening and abut against the upper half of the spring, the same causing the spring, under pressure of steam against the diaphragm, to operate by latitudinal extension rather than by contraction."

258. For an *Improvement in Sewing Machines;* David W. Clark, Bridgeport, Assignor to A. L. Clark, Fairfield, Connecticut.

Claim.—"1st, The employment of an adjustable guide, constructed and arranged for the purpose of guiding the needle J, and its thread, stripping the loop of needle C, and placing the loop of needle J. 2d, The combination of spring with guide, for holding the needle J within the groove of the guide. 3d, The employment of a swinging plate, serving as a loop stop for both stitches."

259. For an *Improvement in Cream Freezers;* Enoch S. Farson, Assignor to self and Henry H. Brown, Philadelphia, Pennsylvania.

Claim.—"The concave beater, in combination with a scraper and an oscillating horizontally placed cream cylinder, the same being arranged so as to operate together."

260. For an *Improvement in Railroad Car Brakes;* Daniel H. Feger, Assignor to self and Mahlon M. Wombaugh, Cincinnati, Ohio.

Claim.—"The arrangement of the friction pulley concentrically on the front axle of the truck, and combining the same with the brake and with the sliding buffer or pulling bar, by means of the pivoted vertical spring friction block, pivoted horizontally, rising and falling shoulder bar, and transverse pins, said parts being arranged relatively to each other and operating in conjunction."

261. For an *Improvement in Belt Coupling;* Samuel Green, Grand Rapids, Michigan, Assignor to Silas B. Green, Rochester, New York.

Claim.—"The plate or stock, slotted and provided with tongues, one or more, corrugated at one edge and provided with spurs arranged and applied to the ends of the belt."

262. For an *Improvement in Tracks for City Railways;* E. S. Gardner, Assignor to self and John H. Gould, Philadelphia, Pennsylvania.

Claim.—"Forming between the rails of a city railroad track, an underground tunnel, and hanging a series of pulleys within the same, said tunnels having a longitudinal slot near the level of the ground, and being otherwise so arranged that a rope may be used for drawing the cars along, without impeding the passage of the vehicles across the same."

263. For an *Improved Ships' Bulkhead;* Charles Maliphant, Assignor to Thomas West, City of New York.

Claim.—"The arrangement of two or more thicknesses of crossed planking, the interposed felt, or other equivalent material, and the stanchions, with each other."

264. For an *Improved Egg Beater;* Patrick Mihan, Assignor to self and G. Davis, Boston, Massachusetts.

Claim.—"The beating apparatus, in combination with the portable plate or cover, so that it may be either held in the operator's hand or placed on the top of a vessel."

265. For an *Improvement in Revolving Fire Arms;* F. D. Newbury, Assignor to R. V. DeWitt, Jr., Albany, New York.

Claim.—"The lever, or its substitute, for the purpose of cocking the hammer, holding the same when it has been cocked by hand, rotating the cylinder, and holding the cylinder firmly in the act of firing. The hammer with its pin, in combination with lever for cocking by hand. The combination of hammer, lever, ratchet wheel, and trigger."

266. For an *Improvement in Knitting Machines;* Joseph Vickerstaff, Assignor to Martin Landenberger, Philadelphia, Pennsylvania.

Claim.—"Imparting to the sets of thread guides, the continuous vibratory movement combined with the transposing movement, by means of the cam wheel acting in conjunction with the lever and arms, or equivalent devices."

267. For an *Improvement in Railroad Car Axle Boxes;* R. N. Allen, Cleveland, O.

Claim.—"1st, The self-adjusting collar or washer, in combination with the slide partition and packing. 2d, The box and key, provided with articulating surfaces, in combination with the key, for the purpose of relieving the axle from strain, and of conveniently removing and replacing the box and collar, by simply relieving the axle from strain without removing it."

MECHANICS, PHYSICS, AND CHEMISTRY.

Combustion of Gunpowder.

MM. Bunsen and Schischkoff, have published in the *Annalen of Poggendorff*, an elaborate investigation into the theory of gunpowder, from which we take the following results:—

1. The gases from the explosion of gunpowder contain in every 100 volumes, carbonic acid, 52·67; nitrogen, 41·12; carbonic oxide, 3·88; hydrogen, 1·21; sulphuretted hydrogen, 0·60; oxygen, 0·52.

2. The greyish viscous liquid which condenses from the smoke of gunpowder, contains—sulphate of potassa, 65·29; carbonate of potassa, 23·48; sub-carbonate of potassa, 4·90; hydrate of potassa, 1·33; rhodanuret of potassium, 0·55; nitrate of potassa, 2·48; carbon, 1·86; carbonate of ammonia, 0·11.

3. The residuum contains—sulphate of potassa, 56·62; carbonate of potassa, 27·02; sub-carbonate of potassa, 7·57; sulphuret of potassium, 1·06; hydrate of potassa, 1·26; sulpho-cyanide of potassium, 0·86; charcoal, 0.97.

4. One gramme of powder gives residuum, 0·6806; gases, 0·3138 (loss 0·0056) grammes. In volume, the gases occupy 193·1 cubic centimetres, in place of 330·9 according to the received theory.

5. The heat given out by the combustion of gunpowder, is 619·5° cent. (1145° Fahr.) The temperature of the flame must be 2993° (5390 Fahr.)

6. The tension of the gases at the moment of explosion does not exceed 4373 atmospheres, in place of 50,000 or 100,000, at which it has been estimated.

7. The amount of force exerted by 1 lb. of powder, is 221,240 lbs. raised 1 foot high.—*Cosmos*, vol. xii., p. 37.

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*Scientific Burglary.**

During the last few months several of the ordinary iron safes have been burglariously opened in London and Manchester, by means of a powerful instrument employed by the thieves in cutting large holes through the iron doors, whereby they have gained access to the works of the lock. The construction and operation of the instrument were unknown until a few weeks since, when, happily, one of them with all its loose appliances was secured by the police. It would be obviously wrong to

*From the Lond. Mech. Mag., February, 1858.

publish a description of the apparatus, but, having inspected it minutely, and seen it in operation, we are enabled to state that great ingenuity and mechanical skill have been bestowed upon its contrivance. Of course the discovery has rendered a counter improvement in the safe itself absolutely essential to security; and it is with much pleasure that we are in a position to announce the introduction of such an improvement. By the courtesy of the Metropolitan Police authorities, Mr. Chubb, the eminent lock and safe manufacturer, of St. Paul's Churchyard, has been allowed to examine and experiment with the instrument, and he has succeeded completely in providing a simple method of baffling its operation. The improvement consists in placing throughout that portion of the door which is in front of the lock a number of hardened screwed steel plugs, sufficiently close to each to prevent either an ordinary drill or circular hollow cutter from passing through without encountering several of the plugs. These plugs of hardened steel have the effect of utterly destroying the edge of every description of cutter which can be used with the burglar's apparatus, and consequently render the safes secure from its operation. All Chubb's fire-proof safes and strong-room doors are now made with the above improvement, and old safes may readily have it applied. It has been protected by Letters Patent.

Apparatus for Determining the Velocity of Currents.

M. Darcy has proposed an improvement upon Pitot's tube apparatus for determining the velocity of currents.

In Pitot's apparatus two parallel tubes, connected together at top and open below, the plane of the opening of one being parallel, and that of the other perpendicular to the current, were lowered into the stream, and the velocity of the current was determined by the difference of heights of the liquid in the tubes. The disadvantages were, that the instrument itself produced an eddy which modified the velocity to be determined; that the extremities of the tubes were not sufficiently close, to be under the same circumstances; and when a deep seated current was to be examined, the tubes required were of inconvenient length.

In M. Darcy's modification, the tubes have stop-cocks attached to them near their lower extremities, which are opened and shut by the same key, worked by cords from above; below the stop-cock, the tubes are both bent at right angles, and prolonged sufficiently to clear the eddy made by the solid part of the apparatus, and then terminated by openings, one parallel to, the other perpendicular to the current. The tubes are fixed upon a board attached to a vertical rod, upon which it works as a vane, so that the current itself keeps the openings of the tubes in the proper positions. The apparatus being lowered to the proper depth, the stop-cocks are opened, and when the levels of the liquid have been attained in the tubes, the cock is again closed, and the tube raised and examined. Another stop-cock at the top of the apparatus allows the air to be compressed in the tubes, when it has to be entirely submerged, and thus avoid the inconvenience of using very long tubes.—*Cosmos.*

For the Journal of the Franklin Institute.

Particulars of the Steamer Le Voyageur Le Mer.

Dimensions.

Hull built by George A. Stone. Machinery by Atlantic Works, Boston, Massachusetts. Intended service, Pacha of Egypt.

HULL.—

Length on deck, from fore part of stem to after part of stern post, above the spar deck,	204 feet	5 inches.
Breadth of beam at midship section,	36 "	7 "
Shear,	2 "	
Depth of hold to main deck,	15 "	8 "
" to spar deck,	22 "	
Dead rise,	1 "	6 "
Length of engine and boiler space,	58 "	6 "
Draft of water at load line (300 tons of coal, 175 men, and provisions),	19 "	
Tonnage, custom-house, 1220 88-95.		
Area of immersed midship section at above draft, 457 sq. ft.		
Contents of bunkers in tons of coal, 200.		
Masts and rig—Ship.		

ENGINES—Two—Oscillating.

Diameter of cylinders,		54 inches.
Length of stroke,	3 feet.	
Maximum pressure of steam in pounds, 25 to 30.		
Cut-off (Corliss') usually,	1 "	6 "
Maximum revolutions per minute, 40.		

BOILERS—Four—Vertical tubular.

Length of boilers,	12 feet	9 inches.
Breadth "	6 "	6 "
Height " exclusive of steam chimney,	11 "	6 "
Weight of " without water, 60,000 pounds.		
Number of furnaces, 8.		
Breadth "	2 "	6 "
Length "	8 "	6 "
Length of grate surface, 170 sq. feet.		
Number of tubes, 2400.		
Internal diameter of tubes,		2 "
Length of tubes (vertical),	5 "	
Heating surface, 8000 sq. ft.		
Diameter of smoke pipe,	6 "	8 "
Height "	43 "	6 "
Description of coal, Anthracite or Bituminous.		
Draft—blowers.		

PROPELLER.—

Diameter of screw,	15 feet	6 inches.
Length of blades,	5 "	
Pitch of screw,	28 to 30 "	
Number of blades, 4.		

Remarks.—Floors, *molded* L, 6 inches, *sided*, 3 inches. Frames apart at centres, 18 inches. Cross floors under engines. Five water-tight bulkheads; with tanks, capacity of 10,000 gallons. Five independent steam, fire and bilge pumps. Box-keel, 18 inches deep by 10 inches wide. Seven keelsons, centres 30 inches deep by 10 inches wide. Side, 18 inches deep by ½-inch thick. Hull, clincher built.

General Description.

The iron steam propeller, built at East Boston, October, 1857, for His Highness Said Pacha, Viceroy of Egypt, has two decks, and except in the middle of the ship, a third or orlop deck. The upper deck is flush, except a trunk 18 inches high forward of the mainmast, and embracing the space for smoke pipe, galley, steam-pipes, fire engine, &c., over the boilers. All the entrances from this deck below, are covered with mahogany sky-light booby hatches, and all have substantial hatches fitted to put on when required. There are two nine-inch shell guns (Dahlgren pattern,) on the upper deck, one forward and one aft, and two brass six pounder signal guns. Complement of men is 175, all told.

The frame of the ship is angle iron, 6 ins. by 3 ins. and 18 inches from centre to centre, covered with iron plates $\frac{3}{4}$-in., $\frac{5}{8}$-in., $\frac{1}{2}$-in., and $\frac{3}{8}$-inch thick at top; bulwarks and plate iron $\frac{1}{4}$-inch thick. All the frames run up and bolt to the under side of the rail, except in the ports where they are cut off at the plank-shear, which is wrought iron, $\frac{3}{16}$-in. thick, 6 ins. deep and 3 ins. swell, and the top and bottom flanches riveted to the bulwarks and upper strake. Rivets, $\frac{7}{8}$-inch and $2\frac{1}{8}$-inch from centre to centre; rivets, $\frac{3}{4}$-inch and $2\frac{1}{8}$-inch from centre to centre, and rivets, $\frac{5}{8}$-inch and 2 ins. from centre to centre. The plates are about 6 feet long by 2 feet width, amidships.

The bulwarks are riveted to all the frames.

The keel is box-shaped, 18 inches deep, 10 inches wide, and $\frac{3}{4}$-inch thick, riveted to the garboard strakes, and is covered by a tie plate $\frac{3}{4}$-in. thick riveted to the garboard strakes, and caulked watertight throughout.

The keelsons are seven in number; the main keelson is box-shaped, 30 ins. deep, 18 ins. wide, and $\frac{1}{2}$-inch plate iron riveted to the garboard strakes; the remaining six keelsons are 18 ins. deep by $\frac{1}{2}$-in. plate iron, strengthened by angle iron 6 ins. by 3 ins. doubled. The ship is cross-keelsoned by plate and angle iron, under the engine bed plate, and under the fore and mainmast steps; all the keelsons are riveted through the bulkheads with $\frac{7}{8}$-inch rivets, the rivet holes reamed to fit.

The stem-piece is forged iron, riveted to keel, and covered outside by the bow plates, which are doubled; this stem is 6 ins. by 3 ins., and double riveted. The main stern post is forged iron, 18 ins. fore and aft, and $8\frac{1}{2}$ ins. wide, double riveted to keel and stern frame, and scarphed to the after stern post; the after stern post is also forged iron, 12 ins. fore and aft, and 6 ins. wide, scarphed, keyed, and riveted to main stern post at the keel, and secured to the same at top by a wrought iron knee riveted to both stern posts; all these rivet holes are reamed, and turned to fit. In the bow and run are some 40 to 50 iron plates riveted across the ship to the frames and plates, to act as breast-hooks, $\frac{3}{8}$-inch thick, and 6 ins. to 10 ins. wide. The rudder is hollow, of $\frac{3}{8}$-in. plate, caulked water-tight; rudder post is forged iron, 5 ins. diameter, riveted into the rudder; the rudder braces are three in number, of forged iron, 7 ins. wide by 1 inch thick.

There are five plate iron bulkheads in the lower hold running up to the berth deck, $\frac{3}{8}$-in. and $\frac{5}{16}$-in. thick, single riveted and caulked water-

tight, and braced by angle iron 6 ins. by 3 ins., and 4 ins. by 3 inches, spaced 15 ins. from centre to centre; all the frames of the ship as well as those on the bulkheads are riveted once in 6 to 9 ins. apart; where practicable they are riveted once in 6 ins. Two of these bulkheads run direct to the under side of the spar deck beams, and are secured to them by angle iron 6 by 3 ins., and braced like the lower bulkheads. The space between these two bulkheads (58½ feet in length,) is taken up by machinery, boilers, coal bunkers, galley, and pump room: the berth deck in this compartment, as well as all the bulkheads in the same, galley, pump room, engineer's store-room, and coal bunkers are of ½-inch plate iron, braced with angle iron; berth deck beams are of angle iron, 6 by 3 ins., and 4 by 3 ins. stanchioned to the keelsons. There is an extra strengthening bulkhead, ¼-inch plate iron, running from the berth deck to the spar deck, and attached to the sides of the ship between the engines and boilers.

The knees under the berth deck are 6 by 3 ins., angle iron doubled, riveted together and to the frames, and bolted to the berth deck beams by lag screws; one of these knees to every beam.

The mast steps are cast iron 2 ins. thick, ribbed and riveted upon the main and cross-keelsons.

Plating, frames, and forgings are all American iron.

Wood work.—Between the iron frames are fillings of hacmetac timber throughout the ship, measuring 12 ins. thick at the butts, 7 ins. at the spar deck beams, and 6 ins. at the rail, and running from three feet below the berth deck beams up to the under side of the main rail; these fillings are solid wood, completely filling all the space between the frames, being nearly all in one piece each, and where made in two pieces are scarphed; ceiled over with yellow pine plank, 4 ins. wide by 3 ins. thick, except in the coal bunkers, where the ceiling is iron.

The outer sides of the bulkheads enclosing the engine and boiler rooms, are covered with 6 inch square timber, ceiled over with yellow pine plank, 4 ins. wide by 3 ins. thick, caulked and puttied, as is also all the fore and aft ceiling.

The spar deck beams are yellow pine, 14½ ins. wide by 10 ins. deep, having an iron strap let in flush each side at the ends, and riveted through the beam, being three feet long, six inches wide, and ⅜-th inch thick; the ends of these beams rest in iron pockets ⅜-inch thick, projecting 12 inches from the sides of the ship, and riveted to the frames and plates. Four large bolts go through the pocket, straps, and beam, and rivet on each side.

The berth deck beams are same size as the spar deck beams, and have the same fastening. Between the beam ends are filling in pieces of yellow pine, bolted down edgeways.

Under the spar deck beams is a clamp of yellow pine 8×12 ins., two thick strakes over the berth deck water way, 8×7 ins; a berth deck water way 15 ins. square, and a thick deck strake of 9 ins.

Inside of each of these is an iron plate band, 2½ ins. wide×¾-ins. thick, which goes entirely round the ship, secured to the frames, and through which these clamps and thick strakes are screw bolted.

The ceiling here (between the clamp and thick strakes,) is 4×3 ins. thick, yellow pine.

Has a full set of hacmetac hanging knees between decks, thoroughly bolted; the fore and aft deck carlines are all kneed off.

The spar deck frames, also the berth deck frames in the bow and run, are solid timber 10 ins. thick.

Below the berth deck beams, are two yellow pine clamps, $11\frac{1}{2} \times 6$ ins.; inside of the upper clamp are two iron plate bands clear round the ship, to which the clamp is screw bolted; the lower clamp is blunt bolted.

The ceiling of the hold below the timber work, is 2-inch plank secured to the frames.

There are in all, ten iron bands around the ship to secure the wood work, and attached to the frames, measuring $2\frac{1}{2}$ ins. wide $\times \frac{3}{4}$-ins. thick; two to each water way; two to the upper clamp; two to the lower clamp; one half-way up between decks under the ceiling, and one above the plank shear.

The spar and berth deck plank are 4 ins. deep $\times 2\frac{5}{8}$ ins. wide, yellow pine, fastened edgeways to each other and diagonally to the beams and carlines. The orlop deck plank are 3 ins. deep $\times$ 4 ins. wide, spiked and bunged in the ordinary manner.

The bulwarks are ceiled with yellow pine plank 4 ins. $\times$ 3 ins.; caulked and puttied.

Main rail, yellow pine, 15 ins. wide, 6 ins. deep, bolted to the tops of the frames.

The orlop deck is secured with wood lodging knees. Lower hold stanchions are nearly all forged iron; the between deck stanchions of oak.

Forward of the fore hatch, and under the orlop deck, is a powder magazine with wooden bulkheads and air-spaces, and lined with copper soldered tight; this can be flooded at pleasure; forward of this, is the boatswain's locker.

In the after part of the ship on the orlop deck are various storerooms.

Under the orlop deck, in the fourth compartment, is a spirit room, which, in case of fire, can be flooded at pleasure by outboard gates arranged for the purpose.

The berth deck forward of the boiler room bulkhead, is occupied by the crew and fireman; and that aft the engine room bulkhead, by cabins and state-rooms.

The galley and pump room over the boiler, as before described.

Is ship rigged, snug masted, equipped in this respect as to size for a vessel of about 800 tons. White pine lower masts, yellow pine topmast and bowsprit; spruce topgallant masts; cotton duck sails; American hemp rigging; patent blocks throughout.

Machinery.—Has two direct acting oscillating engines; 54 ins. diameter of cylinder, and 36 inches stroke; Corliss cut-off and regulator. Main shaft 13 ins. diameter; propeller cast iron, four bladed, 5 ft. long, $15\frac{1}{2}$ feet diameter, and 28 to 30 ft. pitch; intended revolutions 40; pressure of steam 25 to 30 lbs. per square inch (*see previous* "*dimensions*"); 2 blowers to furnaces, and for ventilating cabins, 5 feet 4 ins. diameter, and two blowing engines of 8 inch cylinder and 12 ins. stroke.

Four tubular boilers, Montgomery patent, built in New York, in April, 1857, without water bottoms; bolted to cast iron supports, riveted to

the main and side keelsons, and have a passage two feet wide all about them; they are covered with felt and cased with lead soldered at the edges, $\frac{3}{8}$-inch thick, double riveted shells, and screw-stayed once in 7 ins.; made of first quality American iron; the furnaces are stayed to the crowns of the boilers.

One telescope chimney with screw and capstan arrangement in the fire room for reefing it—is made of $\frac{3}{16}$-inch iron, supported on four angle iron beams, 30 ins. deep, extending across and bolted in the main hatch.

Fire room is 12 ft. fore and aft between the boilers, and 19 ft. wide across the ship; fire room floor is cast iron, $\frac{3}{4}$-inch thick; 30 ins. above the bilge, with tight joints, as well as the engine room floor and coal bunkers, to prevent coal and cinder from working into the bilge.

Furnaces are $4\frac{1}{2}$ ft. above the skin of the ship.

The steam pipes are provided with expansion joints.

Has two outboard and two bilge injections to engines; two eight-inch outboard gates to steam fire engines, and one three-inch outboard gate to deck fire engine; has two Worthington steam pumps, 24 ins. diameter of cylinder, 14 ins. water plunger for bilge pumps and fire engines, and having eight three-inch hose butts on deck; two Worthington steam pumps, 12 ins. diameter of cylinder, and 7 ins. diameter of water plunger, for feeding the main boilers, and one Worthington pump, $6\frac{1}{2}$ ins. diameter of cylinder, $4\frac{1}{2}$ ins. water plunger, for feeding the donkey boiler; has a large donkey boiler on the berth deck over the engines containing 500 sq. ft. heating surface, and 22 sq. feet grate, is $5\frac{1}{2}$ feet diameter, 16 ft. long, $\frac{3}{8}$-inch thick, double riveted; fire box stayed with screw stays 6 ins. apart, made of best American iron; has 174 brass tubes 2 ins. diameter, 6 ft. in length, and superheating apparatus; has a steam pipe leading into the water from the main boilers, for the purpose of heating it quickly, and by this means can start all the steam pumps within fifteen minutes from the time of lighting its fire. This boiler is raised 16 feet above the skin of the ship.

The two largest Worthington steam pumps are in an iron room raised 18 ft. above the bilge, and connect with every compartment by means of an eleven-inch iron pipe running inside the main keelson, and packed where it passes through the bulkheads; a series of eleven-inch gates open this pipe to each compartment, and an eight-inch gate to each of the Worthington pumps, which also connect with the outboard by two eight-inch gates; by means of this keelson pipe and its attachments to the steam pumps, one or all of the compartments can be flooded and pumped out. Also, by means of this pipe, the water from any compartment can be let into the engine compartment, and be taken out by the air pumps on the main engines.

All the Worthington pumps are arranged to work from any one of the four large boilers, as well as from the donkey boiler; the two Worthington pumps for feeding the main boilers, are also arranged for pumping out the bilge.

All these pumps are provided with extra steam and water valves, valve stems, and plungers complete.

The gates in the keelson pipe are operated from the berth deck, by means of spindles attached to their stems.

All steam and water-pipes of every description, are placed above the engine and boiler room floors, in sight of the engineer.

Has a fire engine on the spar deck with two cylinders 6 ins. diameter, 14 ins. stroke, capable of throwing a stream of water $\frac{3}{4}$-inch diameter to the trucks, and takes the water from the bilge or outboard as required.

Outfit.

2 Woodstock anchors, (American,) weighing 3811 and 3640 lbs.
2 Porter's patent " weighing 3899 and 3822 lbs.
1 Iron stock stream anchor, (American,) weight 1232 lbs.
1 Kedge anchor, weight 521 lbs.
2 Chain cables, (American,) $1\frac{3}{4}$ ins. and $1\frac{1}{16}$ ins., 90 fathoms each.
1 Stream chain, " $\frac{7}{8}$-inch, 90 fathoms.
Emerson's patent capstan for purchasing anchors ; largest size.

6 Raymond's metallic life boats—four of 25 ft. length, 6 feet breadth, 28 ins. depth, and two of 22 ft. length, 5 ft. 3 ins. breadth, and 25 ins. depth, each provided with spars, sails, oars, water breakers, compass, covers, and awnings. Altogether, they will carry 200 men safely; are all hung at davits with their furniture on board ready for use.

Water tanks of iron fitted to the ship, capable of containing say 10,000 gallons of water. Gilmour's patent anchor, shackle and block, for letting out two or more anchors on one chain. A complete diving apparatus for examining the vessel's bottom at sea. Compasses, corrected by Capt. Griffith Morris. Spare sails, spars, blocks, and rigging. Boss patent rig. Marryatt's code of signals. Droinet's patent log riveted to the ship. Standing steering wheels and wire steering rope. Spare tiller on deck. 8-inch Fog whistle communicating with each of the five boilers.

Large engine lathe driven by separate steam engine attached to donkey boiler. Complete setts of machinist's, blacksmith's, and carpenter's tools, all descriptions. 800 feet of 3-inch hemp dubbed fire hose. 10 blunderbuss pipes, $\frac{7}{8}$-th inch nozzles, for fire. 4 copper pipes, $\frac{3}{4}$-inch nozzles, for wetting sails. 200 cork jackets. 50 Tewksbury life-seats, covered with rattan. 36 leather fire buckets. 4 fire axes. 3 dog spanner belts. 6 dog spanner wrenches. Spare hose, couplings, packing, wrenches, &c., &c.

The signal lanterns are fitted with steam coils for keeping the oil hot in freezing weather, and to prevent their being extinguished.

New Medium for Paints.

The liquid, which in the system proposed by M. Sorel, replaces oil, turpentine, and the other liquids and vehicles employed in common painting, is an aqueous solution of chloride of zinc in which an alkaline tartrate has been dissolved. These tartrates possess the valuable property of retarding the thickening of the paint before it is employed. To give pliancy and adhesiveness to the painting, there is added to the liquid, gelatine or starch, which is rendered soluble by heating the

liquid. Care must be taken not to heat it sufficiently to change the starch into dextrine or glucose.

To form the new paint, whatever may be the color, the above liquid and the oxide of zinc are used. For colors, the same materials are added to the coloring matter.

The coloring matters used in common painting may be employed.

The new paint possesses the following advantages:—1st, It is not necessary to grind it; it is sufficient to soak the powder with the liquid; it is then employed like ordinary paints.

2d, It is as beautiful and firm as oil paints; it covers better, and does not blacken by sulphureous emanations like lead paints.

3d, It has no smell whatever, and dries very quickly; in winter a coat may be given every two hours, and in summer one every hour, which permits an apartment to be painted and inhabited the same day without any smell of paint.

4th, It resists dampness and water even when boiling; and may be washed with soap like oil paint.

5th, In consequence of the chloride of zinc which it contains, it is eminently anti-septic, and perfectly fitted to preserve wood from rotting.

6th, It possesses in a high degree the property of diminishing the combustibility of the wood; to increase this effect borax or boracic acid may be added to the liquid.

7th, It presents no danger either to those who prepare, or those who use it.

It is, moreover, cheap, being composed of materials which are in great abundance, and can never be scarce; and both liquid and powder may be indefinitely kept and transported to any climate without change.—*Cosmos*, March 12th, 1858.

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*A new Invention for Consuming Smoke.**

An ingenious pamphleteer, Mr. Peter Spence, of Manchester, says a provincial paper, "proposes the abolition both of chimneys and smoke altogether. Not only of smoke but of chimneys. The plan is, to have smoke drains under the streets, just as there are drains for water at present; and the only difference is, that whereas the latter require a fall, the former will be all the better of a rise—the specific gravity of water causing it to descend, and of smoke to ascend. Mr. Spence restricts his project to Manchester, for which he would build one chimney according to the specifications of the Tower of Babel. A Dundee paper invites Mr. Spence, to 'come and try his plan in Dundee. We should need no chimney-building here. The Law (a conical hill), behind the town, only requires a hole made through it to become one of the finest natural chimneys possible. Almost all our great factory chimneys are in a line east and west, and one main smoke drain would answer for them; then the ascending drain might be carried up by the side of the Newtyle Railway, and through the centre of the Law, from which the smoke would emerge like another Vesuvius'!"

* From the London Builder, No. 766.

*Report on the Ships' Compass.**

[Second Report of the Liverpool Compass Committee to the Board of Trade.]

Errors arising from the Heeling of Iron Ships.—These are among the most perplexing which demands a captain's attention. As a number of causes may conspire to produce, modify, or cancel their effect, it is not surprising therefore that the knowledge obtained on this subject is very incomplete. Among such causes may be named the following:

The rising or lowering of the attracting mass, causing its magnetism to act with greater or less leverage as it approaches to, or recedes from, the plane of the compass card.

Vertical iron or magnets below and near the compass.

Induced vertical polarity in iron deck beams, increasing as they incline from their usual horizontal position.

Proximity of badly proportioned and badly placed chain-boxes.

Action of horizontal compensating magnets when they are placed below and too near the compass card.

This last, though partially corrective of some errors from heeling in certain positions of the ship, appear to aggravate them in others.

The three first-named causes may be described as tending to attract the north end of the needle to the weather side of the ship in north magnetic latitude, and to leeward in the south magnetic hemisphere; and as increasing or decreasing the usual deviations according to their name and the direction of the ship's head. These three may act in the same direction and in the same ship. It is difficult to estimate their separate effects, but the last is supposed to be most prejudicial. The great expense attendant on heeling and swinging ship in port, and the delay caused by such an experiment where every hour is valuable, have as yet prevented its being thoroughly tested. Deductions can only be made, therefore, from the evidence afforded by various captains, and an inspection of the arrangement of the iron near the compasses of their respective ships.

Evidence from a number of captains shows—

1. That in a large portion of iron ships the compasses are affected by heeling.

2. That errors from heeling are generally most complained of when ships are on or near four-point courses.

3. That when iron ships have heeled over for a considerable time upon northerly courses, they have been found to windward of their dead reckonings.

To these may be added the existence of an impression among compass adjusters and others who have paid attention to the subject (among the latter may be named the managing owner of the Cunard Company, Mr. Charles M'Iver, a gentleman of great experience in iron ships), that iron deck beams are a chief cause of compass disturbances.

The following may also be quoted from a number of other cases:

Captain Bonfellow of the steamship "*Laconia*" states, that the same course which with an even beam would make the Smalls from the coast

* From the Lond. Civ. Eng. and Arch. Jour., Jan., 1858.

of Spain, with wind at N. W. would make the Tuskar to windward, and on the opposite side of the Irish channel.

The captain of the "*Sarah Sands*" states that his compensated steering compass has acted remarkably well, except when his vessel is heeled to some extent. This compass is placed over and comparatively near large masses of vertical iron.

Capt. Leitch of the "*City of Baltimore*" steamship, has given the result of observations made during several voyages. In every instance the north end of the needle has been attracted to the high or weather side of the ship. This is the most extreme case which has been recorded. From slight list to starboard to slight list to port, the standard compass placed about five feet above the deck-house has been observed to change eight degrees. The apparent cause is the iron beams of the deck-house.

There seems reason to suppose that when the deck beams are divided to make space for a skylight, a position for a compass may be found in which the errors from heeling might naturally compensate each other. The errors from vertical induction of deck beams would certainly vary with change in geographical position, or with the earth's vertical intensity. Thus in the "*City of Baltimore*," Capt. Leitch mentions variations in the deviation of three-quarters of a point while his ship was in the Mediterranean, but in the North Atlantic, as he approached America, he has noticed an extreme instance of more than a point and a half.

The use of elevated or Mast and Standard Compasses—Great variety of opinion prevails as to the utility of mast compasses. Though in some ships they have been discontinued after a trial, their use is becoming very general. Several examples have been given in the first report to show that they were not always free from a considerable amount of error. Many others could be quoted, especially those belonging to ships built with their heads to the south. In moderate weather and large ships, mast compasses are stated to act well; but in small ships, where the motion is greater, the oscillation prevents their being of use except in fine weather. In nearly every case they show an attraction to ship's head in north magnetic latitudes (giving east deviation with ship's head east, and west deviation with ship's head west, taking ships to the south of their course), and very little quadrantal deviation. The usual plus quadrantal deviation is found to decrease as the compass is carried aloft, and is believed in some cases to change to minus quadrantal after a certain elevation is attained.

Modes of Swinging Ship.—Undoubtedly the best and easiest mode of ascertaining the deviations of a compass is by reference to the bearings by it of a different object, whose true magnetic direction is known ; but in a river or a confined dock such distant object is seldom attainable. Next to this is the system of fixed magnetic bearings of a conspicuous object such as have been adopted at the port of Liverpool. The principle is the same as that of reciprocal bearings, with the two advantages of freedom from error in the shore compass, and saving the time usually lost in repeating and deciphering the shore signals. There is another mode sometimes adopted,—that of carrying the shore compass round the dock, so as always to be in a line with the ship's masts, and by preconcerted signals checking the ship as she approaches the true points of the

compass. This plan does not admit of accuracy, even when pains are taken to ensure it. To an adjuster who understands his business it must be tedious; while in the confined situations, in which only it can be employed, the shore compass is liable to varying disturbances, which give rise to most inconsistent tables of deviations. In some cases in Liverpool this has occasioned serious errors. In one case an uncompensated steering compass was made to have east deviation on every rhomb.

Adjustment of Compasses.—Much difference of opinion has existed not only as to modes of adjustment, but also as to the propriety of attempting it mechanically in any way. Although this question may be considered as settled in practice, yet it is believed that in only one instance which requires to be named, besides that of the Royal Navy, is magnetic compensation dispensed with in iron ships, and that is a line of steamers plying north and south for 1200 miles on each side of the magnetic equator on the west coast of South America. Experience proves that magnetic compensation is seldom so perfect as to dispense with the necessity for a table of deviations even in short voyage ships, while in ships making long voyages the change is frequently so great as to make a deviation table worthless, except for first clearing the land. This is more especially the case with steering compasses; and here the inconvenience complained of is as often want of *directive power* in the needle as the extent of the deviation or the difference between the indications of this compass and the standard. In almost all iron ships which sail round the Cape of Good Hope, perhaps in all which reach 40° south latitude and 40° east longitude, complaints are made of this. In the "*Great Britain*," a temporary steering compass had to be fitted much higher than the one commonly used. In the "*Sarah Palmer*," the binnacle compass was quite useless, and a "vertical compass" fixed on the top of a companion, about seven feet above the poop, had to be fitted with lanterns, so as to steer by it instead. Reports of seven or more points deviation are not unusual from ships traversing this part of the world. After deduction has been made for variation of the same name being included with the deviation, as may sometimes be the case, sufficient remains to show that upon some courses the earth's directive power must be most materially diminished. Statements of a similar kind have been made respecting some of the North American steamers. In both localities the earth's directive or horizontal force is small, and when it is further reduced by the opposition of the ship's magnetism, it will readily be seen how weak must be the directive power which remains. Slight causes will then turn the needle aside, or a small roughness of the agate or bluntness of the pivot will prevent the card from traversing freely, perhaps from moving at all until it is entreated at a large angle; and then, by resting on the other side of the magnetic meridian, a report might next day arise of a sudden derangement of the compass from the ship being found 40 or 50 miles on one side of where she was expected to be.

Serious evils arising from the use of oblique, Inclined, and Vertical Magnets.—It has been found in many cases that in certain positions these magnets produce large errors when the ship heels. In one instance an error of four points was reported from this cause. To obviate such causes arising, it is recommended for ordinary use that none but the horizontal

compensating magnets should be employed, and these to be placed fore and aft, or athwart-ship, because oblique positions render any attempt at change while at sea by the captain more difficult, and make his attempts at compensation in the same way almost hopeless. Horizontal magnets, if placed *near* and *below* the compass bowl, may also have an injurious action, and possibly have given rise to some of the fluctuations in the deviations recorded of some floating compasses. One captain, when spoken to on the proximity of a compensating magnet to his steering compass, said, he observed when it was first fixed how a small difference in its position affected the compass needle; yet he stated as a matter worthy of attention, that on one occasion when water from a rusty tank was used to float the compass bowl, the rust in the water so changed his deviations that he was obliged to take it out again. It had not occurred to him that the difference in the level of the bowl might have been the real cause. In this, as in many similar instances, the facts may be accepted when the explanations or alleged causes are inapplicable. When circumstances will not admit of the compensating magnets being placed a sufficient distance below the compass, they should be fixed on the same level as the card.

Experiments on Quality of Sound.

The *Cosmos*, in the number of 25th December, 1857, speaks of a curious apparatus devised by M. Leon Scott, a corrector of the press, by means of which some very interesting experiments were made in reference to the different qualities of sounds, and the cause of these differences. The apparatus consists of a tube spreading out widely at one extremity like a trumpet, and closed at the other end by a thin stretched membrane to the middle of which is attached a very light pencil. The tube concentrates the sounds which enter by its base, and the vibrations of the membrane thus produced are written by the pencil upon a paper coated with lamp-black, which is uniformly passed under the pencil by clock-work. The traces thus produced may be copied and preserved (magnified if necessary) by photography.

When the common accord was sounded on different instruments, the figures formed were very different both in form and dimensions, according as wind instruments, stringed instruments, or the human voice were used. The same differences were seen when the record of singing was compared with that of unmusical noises. M. Scott established this curious fact, that the series of vibrations formed by the sound of an instrument or voice was more regular, even, and consequently more nearly isochromous, in proportion as it is more pure and agreeable to the ear. In shrill cries, and harsh sounds of instruments, the waves of condensation are irregular, unequal, and not isochromous. In one experiment it was shown, that in the impure sounds of the voice, two, and sometimes three, secondary sets of vibrations could be detected, combined with the principal.

This subject is not new, Mersenne, Savart, Young, and others, have devised means for rendering sonorous vibrations visible; and recently

a beautiful series of investigations has been made by M. Lissajous, with a very ingenious and delicate modification of Dr. Young's vibrating spring. But the idea of reading the results is new to us, and the apparatus is so simple, and the experiments so curious and interesting, that we hope many of our readers may be tempted to repeat them.

Ed. J. F. I.

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*On the Conversion of Wood by Machinery.**

[Read before the Institution of Civil Engineers, Dec. 1, 1857.]

In the discussion upon Mr. Molesworth's paper, exception was taken to the author's preference for the wood framing generally used in America. It was admitted, that whilst it was new it might be sufficiently steady, and might absorb or neutralize the vibration; but it was asserted. that the screws soon worked loose, the joints became slack, and the framing trembled. On the other hand, however, cast irom framing was more durable, the joints continued firmly attached, and the whole fabric remained steady; it was easy to neutralize the vibration by inserting beneath the plummer blocks, sheet lead, or strips of wood, which prevented any jarring, and the shafts continued to run evenly, for a greater length of time. The timber most worked in America was soft, and did not require such careful working, or such a smooth surface, as that worked in England, where, on account of the higher price of the material, it was necessary to avoid cutting any timber to waste.

Great difficulties had been originally experienced in setting circular saws, so as to make them run truly; but since a soft packing had been adopted, they could be run at much higher speeds, and the larger plates could be made much thinner. It was asserted, that none of the American circular saws could produce such a good surface on flooring boards, as could be given to them by the fixed planes, under which the boards traveled. It was only necessary to keep the planes in good order, and to make the boards travel sufficiently quick. Straight-planing could be performed at the rate of fifty feet or sixty feet per minute, by fixed planes; whilst the edges of the boards could be worked off square, or be ploughed and tongued by circular cutters. The speed of the circular saws in this country rarely exceeded 7500 revolutions per minute; at that speed thin saws were worked, whilst those used in America were much thicker.

A description was given of a simple mode of planing on the timber sleepers the seats for the iron railway chairs. The sleepers were fastened, with their faces downwards, upon a carriage, traveling on a small railway; and two revolving planes, working upwards, cut the seats simultaneously, with perfect precision, both as to depth and parallelism.

With respect to the form of the teeth of saws, it was asserted that the gullet tooth, with the throats filed bevel alternately on either side, did the best work; but, on the other hand, it was shown, that although that form was excellent for uniform timber, the ordinary "peg" tooth was a better form in case of meeting with any knots, or nails; as if a portion of the peg tooth was accidentally broken, it continued to do its work almost as well as before. The "parrot's-bill" tooth was generally pre-

* From the Civ. Eng. and Arch. Journal, Jan. 1858.

ferred for circular saws; and when cutting soft timber, the number of teeth should be reduced.

At the large establishment of the late Mr. Thomas Cubitt, all the sawing was performed by circular saws, and beautiful specimens of work were exhibited. The timber could be cut to any angle by saws fixed in rising and falling spindles, some of which made as many as 6000 revolutions per minute; the men, however, generally preferred about 3000 revolutions. Any vibration was very prejudicial to the work, and it was essential that every part of the high-speed machinery should be perfectly balanced. The question of speed resolved itself into the consideration of quantity against quality; the greater the speed, the coarser would be the quality of the work done.

On behalf of American tools it was urged, that they were found sufficiently strong and steady for the work they had to perform. They were cheaper, and the wooden frames could be easily and cheaply renewed when they became unsteady. The bearings lasted longer than upon iron frames. The American saws had fewer teeth than the English, and were found to cut cleaner. The teeth were generally filed in triplets, the first with a bevel to the left, the second straight, and the third with a bevel to the right; thus they cleared themselves the more readily, and cut much cleaner. The rotating cutters were found to take less power for a given quantity of work than the stationary planes.

To this it was replied, that whilst the rotating cutters were sharp, they did good work, but they were much sooner worn down than the stationary plane, and then the surface produced was ragged. The common carpenter's plane was very nearly a perfect instrument, and the great object was to produce a machine which should, as nearly as possible, imitate its action; and by habit, the workmen, in feeding the stationary planes, presented the wood to the tool in the manner best suited to the quality, and so as to accommodate the cut to the knots. Between 30,000 feet to 40,000 feet of flooring boards could be produced per week with a good stationary plane.

Smart's circular saws were originally about $\frac{1}{8}$-inch thick; thus wasting much timber. The late Sir Isambard Brunel then introduced the large veneer saws, put together in segments; Holland invented the system of packing the saws, and now they could be worked at very high speeds, when 36 inches diameter, and only 14 gauge in thickness. It was found advantageous to leave a space of 2 inches between the teeth, when the saw had its full diameter of 36 inches, and when by constant sharpening, the diameter of the saw decreased, the space between the teeth diminished in a regular proportion.

It was urged, that the production of high finish by machinery was a difficulty, but not an impossibility. Hitherto, the study had been to produce quantity, and quality of work had been sacrificed to it. It was argued, that the practice of wood working was not perfect, and that much might be done by due attention to the subject. The points which required the greatest care were undoubtedly high speed and perfect balance; and it was stated, that the correct proportion of the speed of travel of work to that of the cutters was too generally overlooked. The American speed of $\frac{1}{20}$-th of an inch travel for each stroke of the cutter

was given as applicable for ordinary purposes, but was far too slow a speed for high finish. The system of reducing the work, by sawing as nearly as possible to its finished dimensions, was recommended; and the adoption of roughing cutters in some cases, and also cutting with the travel of the work, instead of against it, were stated to be conducive to high finish. The advantages of a solid bed, the proper angles of cutters, steady bearings, and cutters highly tempered and kept well sharpened, were insisted upon as indispensable to finish. It was urged, that the Americans had made much more progress than the English in the appliances of machinery, and Mr. Whitworth's report was quoted as confirming this view, at the same time it was conceded that the machines which were manufactured by Worssam and McDowall were superior in workmanship to those of America.

A case of failure in the wooden frames constructed in England, was said to have arisen from their not having been properly constructed; and it was urged, that attention should be given, in constructing them, to the quality and seasoning of the wood, as well as to the formation of the joints, which should not only be dependent on a mortise and tenon, but should be shouldered in and firmly secured. If properly constructed, they were very durable, and they absorbed much of the vibration observable in the machines constructed with iron frames.

Artificial Production of Gems and other Minerals.

The late M. Ebelman suggested the ingenious method of producing the gems of the Corundum family, (sapphire, ruby, hyacinth, &c.,) by fusing the alumina with an excess of boracic acid, and then suffering the solvent to evaporate gradually at a high heat constantly maintained. This process is doubtless applicable to all minerals which are formed by the union of their components at a high heat; but, although successful in practice, it gave only microscopic crystals, and the other occupations and subsequent death of the distinguished experimenter, prevented him from prosecuting the subject. Prof. Sainte-Claire Deville, in conjunction with Captain Caron, has recently presented to the Academy of Sciences, at Paris, a new mode of operating, by which it appears, fine crystals of practical size may be obtained. This method, which was probably suggested to the Professor during his investigations on aluminum, consists (when the Corundum minerals are sought,) in establishing the reaction at a high heat between the fluoride of aluminum and boracic acid. The fluoride is introduced into a black lead crucible, and above it, is adjusted a small cupel containing the boracic acid; the crucible is then tightly covered and protected from the action of the air, and heated to a white heat for an hour. The two vapors decompose each other, giving rise to alumina (Corundum,) and the fluoride of Boron. The crystals are rhombohedric with the faces of the regular hexagonal prism; they have but one axis, and are negative, and possess all the optical and crystallographic properties of natural Corundums, as well as their hardness. The crystals produced were sometimes more than a centimetre (0·4 inch) long, and very broad, but are wanting in thickness.

When the materials are used pure, the resulting crystals are of course colorless, but by adding a little of the fluoride of chromium to the fluoride of aluminum, the colored gems, the ruby, sapphire, or oriental emerald may be produced, the colors depending solely upon the proportions of the chrome used, which, in all cases, must be very small, (except in the green gem, M. Damour having detected 25 per cent. of oxide of chrome in ouvarowite.) The colors produced are identical with those found in nature, and the gems retain their perfect transparency. In some cases rubies and sapphires were produced alongside of each other. The zircons and other analogous minerals were produced in a similar way. Chrysoberyl, with its characteristic crystallization, was produced by mixed fluorides of aluminum and glucinum treated as above; zahnite, from the fluorides of aluminum and zinc; staurotide by substituting silica for the boracic acid, or by heating alumina to a high temperature in a current of gaseous fluoride of silicium. But all the silicates thus prepared are very basic, containing a very small portion of silica. Rutile was obtained by the decomposition of a fusible titanate, especially titanate of protoxide of tin by silica.

"In making these experiments we often obtained in solution in the tin, a brilliant substance, crystallizing in large metallic plates, separable from the tin by hydro-chloric acid, which scarcely attacks them. This curious material is an alloy of equal number of equivalents of iron and tin. This appearance and chemical properties give it considerable interest."

These researches are valuable not only from their applicability to the arts; in which, the artificial production of the hard minerals will greatly add to our facilities; but also by their important bearing on the theory of the formation of gems and the production of minerals in nature.

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*Ornithological Clock.**

As botanists have constructed a flower-clock, so (we read in the foreign journals) a German woodsman has recently invented an ornithological clock, by marking the hours of the waking and the first notes of the little singers. The signal is given by the chaffinch, the earliest riser among all the feathery tribes. Its song precedes the dawn, and is heard in summer from half-past 1 to 2 o'clock, A. M. Next, from 2 to half-past 2 o'clock, comes the black cap, (*Sylvia atricapilla*), whose warblings would equal those of the nightingale if they were not so very short. From half-past 2 to 3 o'clock the quail is heard. From 3 to half-past 3 the hedge-sparrow. Then from half-past 3 to 4 o'clock, we have the blackbird, the mocking-bird of our climates, which imitates all tunes so well, that M. Dureau de La Malle made all the blackbirds of a French canton sing the Marseillaise hymn, by letting loose a blackbird which had been taught that tune. From 4 to half-past 4 o'clock the lark pours forth its melodies; from half-past 4 to 5 o'clock the black-headed titmouse is heard. Lastly from 5 to half-past 5 o'clock, the sparrow, the *gamin* of the skies, awakes and begins to chirp.

*From the London Athenæum, September, 1857.

For the Journal of the Franklin Institute.

Particulars of the Steamer Manjoor.

Hull built by Paul Curtis. Machinery by Atlantic Works, Boston, Massachusetts. Intended service, Amoor River.

HULL.—

Length on deck,	189 feet.	
Breadth of beam,	37 "	
Depth of hold,	12 "	5 inches.
Length of engine space,	54 "	
Draft, { forward,	8 "	6 "
{ aft,	10 "	
Tonnage,	785 tons.	
Area of immersed section at load draft,	325 sq. ft.	
Contents of bunkers in tons,	200.	
Masts, three—barque rigged.		
Speed through water—10 miles.		

ENGINES.—Two—Oscillating.

Diameter of cylinders,		42 inches.
Length of stroke,	4 feet.	
Load on safety-valve per square inch,	25.	
Gross indicated horse power at ¼th cut-off.	534.	
Cut-off—variable.		
Average revolutions,	38.	

BOILERS.—Two—Return flued.

Length of boilers,	32 feet	
Breadth "	8 "	6 inches.
Height " exclusive of steam chests,	9 "	6 "
Cubic feet of steam room,	210.	
Number of furnaces,	4.	
Breadth "	3 "	6 "
Length of grate bars,	7 "	2 "
Grate surface,	100 sq. ft.	
Heating surface,	3127 sq. ft.	
Diameter of chimney,	5 "	6 "
Height " above steam chest,	26 "	
Consumption of coal per hour,	1400 lbs.	
Weight of boilers without water, in tons,	47.	
" " with " "	87.	

PROPELLER.—

Diameter of screw,	12 feet.	
Length "	4 "	
Pitch "	26 expanding to 30 "	
Number of blades,	4.	

Remarks.—Frames, *molded*, 15 ins., *sided*, 12 ins.—× 24 inches apart. Three bulkheads; one independent steam, fire, and bilge pump. Hull, strapped with iron diagonally and double laid, 4 × ⅝-inch, with truss straps at top of frames, 5 × ¾-inch. Three upper strakes of planking jogged on and edge bolted. Date of trial April 1st. C. H. H.

A New Cement.

M. Edmund Davy prepares a new cement which is well spoken of, by melting in an iron vessel, equal parts of common pitch and gutta-percha. It is kept either liquid under water, or solid to be melted when wanted. It is not attacked by water, and adheres firmly to wood, stone, glass, porcelain, ivory, leather, parchment paper, feathers, wool, cotton, hemp, and linen fabrics, and even to varnish.—*Cosmos*, vol. xii., p. 41.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, May 20, 1858.

John Agnew, Vice-President, in the chair.
John F. Frazer, Treasurer.
Isaac B. Garrigues, Recording Secretary. } Present.

The minutes of the last meeting were read and approved.

A Letter was read from Lieut. Col. J. D. Graham, U. S. Top. Eng.

Donations to the Library were received from L. A. Huguet-Latour, Esq., Montreal, Canada; Lieut. Col. James D. Graham, U. S. Topographical Engineers, Chicago, Illinois; Edward Miller, Esq., Civ. Eng., St. Louis, Missouri; the Managers of the State Lunatic Asylum, Utica, New York; the Young Men's Mercantile Library Association, Cincinnati, Ohio; the Pottsville Scientific Association, Pottsville, Pennsylvania; and from Prof. John F. Frazer; the Trustees of the Philadelphia Gas Works; Prof. B. H. Rand, Col. W. Davenport, H. P. M. Birkinbine, Esq., and the Mine Hill and Schuylkill Haven Railroad, Co., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of April.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (6) were proposed, and the candidates (2) proposed at the last meeting were duly elected.

Mr. Howson exhibited a working model of Messrs. Gardner and Gould's patent passenger railroad. A tunnel is formed below the ground midway between the two rails, and in this tunnel are hung a series of flanched pulleys for an endless traction rope, which is driven by suitable gearing in connexion with a stationary engine at one terminus of the line.

In the top of the tunnel is a narrow longitudinal slot through which passes an arm connected to the passenger car, this arm being furnished with suitable jaws, by means of which the traction rope may be seized or released at pleasure. It is proposed to keep the rope continually in motion, one-half passing up the tunnel of one street, and down the tunnel of the next street. These tunnels are made sufficiently large to allow any dirt which may drop through the longitudinal slot in the top to be readily removed.

Mr. Howson also exhibited a working model of W. S. Reinert's kneading machine, which consists of a trough, to each side of which is secured a rack adapted to a pinion on each end of a shaft. On the latter is secured a corrugated roller which operates within the trough, and which, by turning the shaft, has a combined rotary and reciprocating motion imparted to it. The diameter of the pinions is much less than that of the roller, and consequently the corrugations of the latter have a combined pressing and scraping action on the butter, dough, clay, or other plastic substance placed within the trough.

Mr. Howson also exhibited a full sized specimen of W. H. Harrison's

double-acting pump, which is of very simple construction, and free from the circuitous passages common to this class of pumps.

It consists of two plain barrels parallel but not in a line with each other, the barrels communicating with, and forming a part of, a central circular chamber in the sides of which turns a shaft. To the latter is secured a lever, one arm of which is connected by a rod to a valved bucket in one barrel, and the other arm to a valved bucket in the other barrel, so that on imparting a vibrating motion to the shaft, a constant flow of water enters one barrel and is discharged from the other.

Mr. H. also exhibited Hiram Smith's improved carpenters' gauges and bevels.

This improvement consists in forming in the stock of such tools an orifice containing a spring, so that a sharp pointed scriber for marking purposes may be inserted in the orifice, and there retained by the spring, which has sufficient elasticity to allow the scriber to be easily withdrawn when required for use.

The blade of the improved square is graduated into inches and fractions of an inch, and a spirit level is embedded in the stock, so that the instrument may serve the fourfold purpose of a square rule, plumb rule, and level.

NOTE.—Illustrated descriptions of the above are in preparation for publication.

W. Jones exhibited several copper tubes taken from the Persson's condenser of Steamer "*Keystone State.*" They presented an example of singular action upon the metal, which, in many places, was perforated with fine holes, sometimes arranged in straight lines, or in spirals, and again in groups, while others were around the edges of irregular-shaped holes; in some specimens, strips of a foot in length were cut out, leaving the edges sharp and straight. In all cases the action commenced upon the outside of the tubes. These tubes were in use for a considerable time, the steamer having run several thousand miles at sea before they gave out. It is supposed that the parts destroyed were imperfections in the metal, and it appears reasonable, sea water having no action upon copper in a pure state, and the disposition of the wasted parts strengthens the probability, as any impurities in an ingot would be arranged similarly by the rolling process. These tubes are to be replaced by others tinned upon the inside and outside, which will prevent a recurrence of such damage.

Mr. P. V. Mathews, of Philadelphia, exhibited his patent method of securing gilding on glass from the effects of frost, steam, water, and the sun's rays, consisting of the application of tinfoil, or other thinly laminated or rolled metal, as a backing for the gilded letters, figures, &c., which are now generally applied on the inner side of panes of glass in windows, transoms, and doors of stoors, offices, &c. The claim is to protecting the letters, &c., from injury, without obstructing the free passage of light through the immediately surrounding parts of the glass.

John Woolman, of Philadelphia, exhibited his patent bolt, it being a flat eliptical bolt, working within straps or casings of a curved triangular form; it can be used to advantage wherever the ordinary bolt is needed or can be applied; but its great merits are that it can be applied to warped or twisted doors, will move easily, and by turning the lever down will bring the door firmly to its proper position.

Mr. S. L. Weigand exhibited his patented "adjustable eccentric," intended to reverse and cut off the steam in locomotive and other engines. A full description will appear most probably in the reports from the Committee on Science and the Arts, that body having examined it. The model is excellently made, and exhibits the action of the eccentric in a satisfactory manner. The lead is the same for the forward or back motion, and steam can be cut off at any point of the stroke as efficiently as by the link motion, while there are fewer parts to keep in order.

BIBLIOGRAPHICAL NOTICE.

Harbors of Lake Michigan.—Letter from the Secretary of War, communicating the last Annual Report of Lieut. Col. J. D. Graham, on the Harbors of Lake Michigan, January 11, 1858.—*Referred to the Committee on Commerce, and ordered to be printed.*—35*th Congress, H. R. Ex. Doc., No.* 23.

The larger portion of this Report, is, of course, occupied with details of little general importance, but it contains, in addition to these, a very minute and interesting account of the observations for determining the difference of longitude between Quebec and Chicago, by means of the electric telegraph between those two cities. The distance by the wires, according to Col. Graham, is 1210 miles, "and yet the signals made at either end of this long line were recognised with perfect distinctness at the other end." The result of the determinations is, that the Roman Catholic Church on Walcott Street, Chicago, is west of the observatory of Quebec, 1 h., 05 min., 41·51 sec. Adding to this the difference of longitude of Quebec and Greenwich, as determined by Lt. Col. Graham in 1842, and reducing the observations from the Church to the City Hall at Chicago; (the centre of the dome of the City Hall was determined to be 1·09 sec. west of the position of the instrumenton the Church,) the longitude of Chicago west of Greenwich, is 5 h., 50 min., 32·08 sec. in time, or 87°, 38′, 01·2″ in arc. According to Col. Graham's Report, the electric fluid passed over the lines in 0·08 sec.; which, if the distance be assumed as given, will give 15,125 miles per hour, a value not materially differing from Walker's determinations. These measures of velocity are, however, rendered very uncertain by the undeterminate swag of the wire, which renders it impossible to estimate its length accurately. Those who are interested in the subject will find in the Report all the details of the determination.

Col. Graham also determined the magnetic declination at Chicago, which he found to be on the 23d of July, 1857, at 4 o'clock, P. M., 5° 46′ 07·5″ east of north.

CORRECTION.

The reader is requested to cancel the illustration, fig. 4, on page 343, as it does not convey the views of the author.

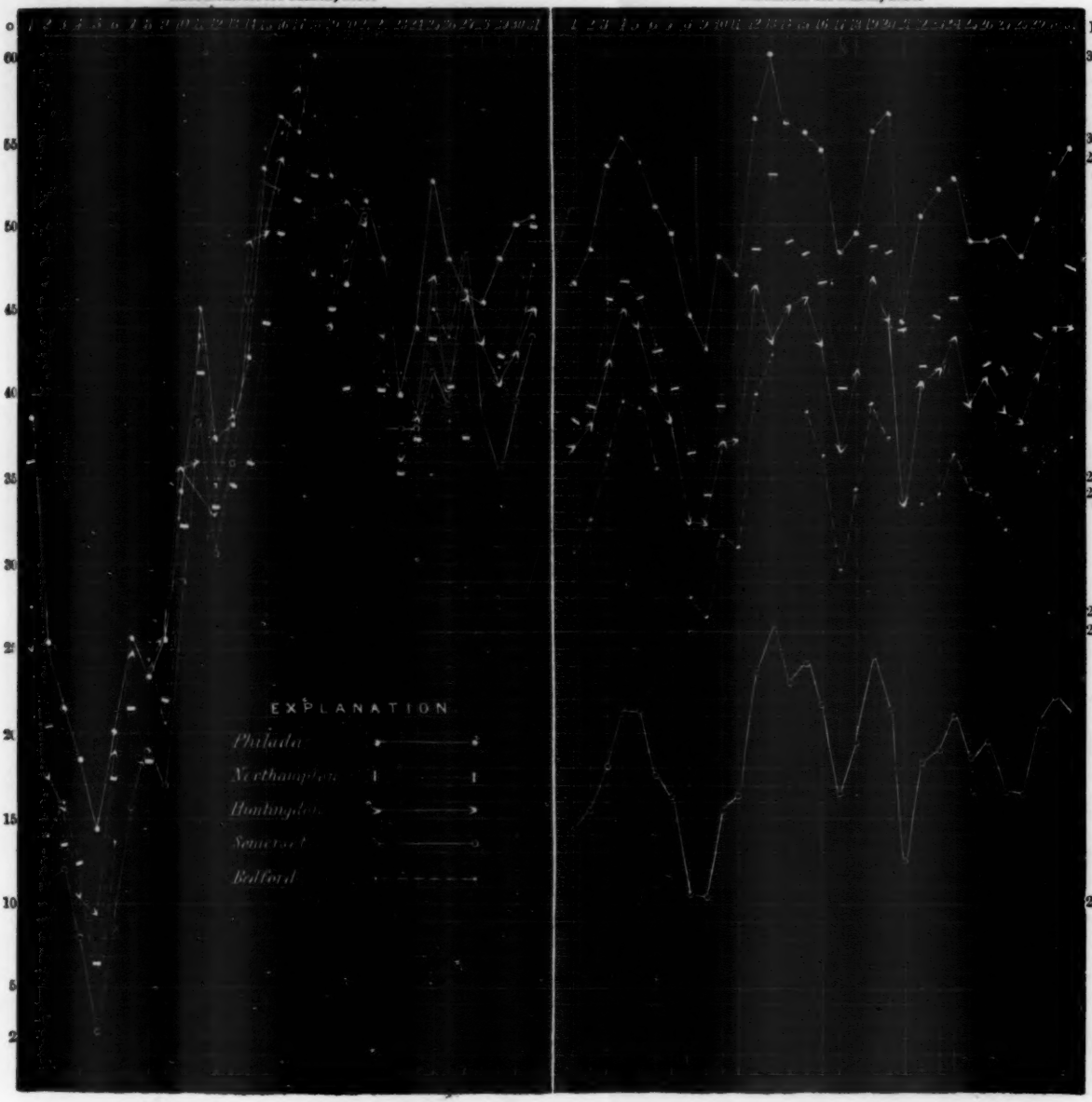
Abstract of Meteorological Observations for March, 1858; made in Philadelphia, Northampton, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

March, 1858.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.								EASTON, Northampton Co.—Lat. 40° 43′ N. Lon. 75° 16′ W. Height above the sea about 340 feet. SELDEN J. COFFIN, Observer.						SOMERSET, Somerset Co.—Lat. 40° N., Lon. 79° 3′ W. GEO. MOWRY, Observer.				BEDFORD, Bedford Co. SAMUEL BROWN, Observer.			HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr.		
	Barometer.		Thermometer.			Relative humidity.	Force of vapor.	Rain and Snow.	Prevail'g winds.	Bar.	Ther.	Relative humidity.	Force of vapor.	Rain and Snow.	Prevail'g winds.	Bar.	Ther.	Rain and Snow.	Prevail'g winds.	Bar.	Ther.	Prevail'g winds.	Ther.	Rain and Snow.	Prevail'g winds.
	Mean.	Mean daily range.	Mean.	Daily oscillation.	Mean daily range.	2 P.M.	2 P.M.			Mean.	Mean.	2 P.M.	2 P.M.			Mean.	Mean.			Mean.	Mean.		Mean.		
	Inch.	Inch.	°	°	°	Per.ct.	Inch.	Inches.		Inch.	°	p. c.	Inch.	Inch.		Inch.	°	Inch.		Inch.	°		°	Inch.	
1	29·575	·112	39·8	8	6·5	40	·104	0·015	N W.	29·160	36·0	40	·096		N W.	27·378	23·7		W.	28·787	27·3	N W.	25·0		N W.
2	29·678	·103	25·2	13	14·7	41	·060		N W.	29·217	20·3	44	·052	0·03	N W.	27·428	11·3		WNW.	28·887	14·0	N W.	17·5	S.	N W.
3	29·928	·249	21·7	13	3·5	41	·060		N W.	29·530	13·8	52	·056	0·01	(var.)	27·559	12·0	S.	W.	29·061	15·7	N W.	15·5		W.
4	30·008	078	18·5	11	3 2	35	·046		N W.	29·590	12·2	25	·028		N W.	27·738	8·0		W.	29·240	11·0	N W.	10·5		N.
5	29·946	·078	14·3	9	4·2	39	·040		N W.	29·547	6 2	41	·030		N W.	27·715	2 3		W.	29·222	6·3	N W.	9·5		N.
6	29·806	·140	20 0	19	5·7	53	·077		W.	29·380	17·3	35	·044		N W.	27·546	8·7		W.	29·042	13·7	N W.	19·0		W.
☽ 7	29·723	·083	25·8	15	5·8	33	·060		W.	29·277	21·3	21	·034		W.	27·479	15·7		W.				25·0		W.
8	29·487	·236	23·3	7	7·2	86	·106	0·608	N E.	29·080	18·7	85	·091	0·13	N.	27·173	18·7	0·033	N W.	28·653	24·3	N W	23·5		N
9	29·391	·228	25·7	11	5·7	46	·077		N W.	28·959	22·0	35	·050	0·03	W.	27·168	17·0	0·049	W.	28·609	20·7	N W.	25·5		N W.
10	29·651	·260	34·3	20	8 7	51	.142		(var.)	29·217	32·2	34	·079		W.	27·418	29·0		W.	28·846	33·7	N W.	35·5		W.
11	29·604	·088	45·0	23	10·7	44	·102	0·065	(var.)		41·3	33	·146		W.	27·463	38·7		W.	28·803	43·3	N W.	36·0		N W.
12	30·062	·458	37 7	15	7·3	24	·073		W.	29·680	33·2	71	·172		W.	27·842	30·7		W.	29·253	34·0	N W.	33·0		W.
13	30·256	·194	38·3	16	6·7	35	·104		WNW	29·903	34·7	27	·069		(var.)	27·977	36·0		S.	29·378	39·0	S W.	38·5		W.
14	30·059	·197	42·3	15	4·7	71	·206	0·017	S W.	29·703	36·0	90	·191	0·15	W.	27·802	45·3	0·305	S W.				49·0	0·169	W.
● 15	30·020	·040	53·5	20	10·5	66	·369	0·075	S W.	29·667	44·3	71	·322	0·03	E.	27·863	52·7	0·130	S W.	29·206	54·3	S W.	49·5	0·016	W.
16	29·970	·050	56 3	25	3·8	61	·448		E.	29·597	49·8	59	·376		(var.)	27·749	52·0		S W.	29·078	55·3	S W.	54·0		W.
17	29·664	·306	55·7	28	5·3	59	·393		(var.)	29·283	51·7	61	·314		(var.)	27·491	59·3	0·023	(var.)	28·745	59·0	S E.	59·0	0·040	S.
18	29·711	·149	60·0	18	6·3	32	·253		W.		53·0	32	·177		WNW	27·634	51·7		W.	28·974	56·3	W.	47·0		W.
19	30·039	·328	53·0	19	7·0	33	·188		(var.)	29·693	45 0	27	·112		(var.)	27·895	44·0		(var.)	29·237	46·7	(var.)	44·0		N.
20	30·036	·120	46·8	22	6·2	40	·202		(var.)	29·680	40·5	42	·156		(var.)	27·733	48·0		S.	29·125	48·7	S E.	51·5		S.
21	29·467	·599	51·7	20	6·8	90	·406	0·092	(var.)					0·26	(var.)	27·281	50·3	0·136	(var.)				50·0		W.
◐ 22	29·763	·295	48·0	16	3·7	27	·119		W.	29·340	40·3	28	·091		N W.	27·563	38·0		W.	28·922	41·5	N W.	43·5		W.
23	29·850	·087	40·0	11	8·0	36	·099		(var.)	29·487	35·2	20	·052		(var.)	27·605	38·0		(var.)	28·957	41·3	N W.	36·0		N.
24	29·885	·041	44·0	21	6·0	25	·099		N W.	29·530	37·5	15	·054		N W.	27·709	38·0		N W.	29·065	38·7	N W.	38·5		(var.)
25	29·707	·178	52·8	26	8·8	29	·175		S W.		43·5	31	·153		(var.)	27·586	41·7		W.	28·966	45·0	N W.	47·0		W.
26	29·709	·102	48·0	15	7·2	18	·082		WNW	29·347	40·7	21	·069		N W.	27 627	39·7		N W.	28·955	43·3	N W.	40·0		W.
27	29·713	·080	46·0	19	4·7	29	·112		N W.	29·330	37 8	35	·091		W.	27·492	48·7	0·191	W.	28·851	48·7	N W.	46·0	0·194	W.
28	29·652	·123	45·2	9	4·2	60	·205	0·252	N W.					0·04	W.	27·498	38·3	0·264	W.				43·0	0·010	N W.
○ 29	29·766	·114	48·0	18	4 2	40	·179		N W.	29·413	42·5	35	·136	}	(var.)	27 680	35·3		(var.)	29·027	41·3	N W.	40 5		N W.
30	29·900	·134	50·0	23	2·7	35	·189		(var.)					0·01	N W.	27·755	39·7		W.	29·096	42·3	N W.	42·5		S W.
31	29·966	·066	50·5	25	1·5	31	·175		(var.)	29·620		27	·132		(var.)	27·714	43·3		(var.)	29·123	47·7	S E.	45·0		(var.)
Means	29·807	·171	40·7	17	6·0	43	·162	1·124	N71°W.	29·422	34·4	41	·120	0·69	N58°W.	27·599	34·0	1·131					36·8	0·429	

Comparison of the Thermometric and Barometric Means of Philada., Northampton, Somerset, Huntingdon, and Bedford Counties.

Thermometer for March, 1858.

Barometer for March, 1858.



Abstract of Meteorological Observations for March, 1858; made in Philadelphia, Northampton, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

1858.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer	EASTON, Northampton Co.—Lat. 40° 43′ N. Lon. 75° 16′ W. Height above the sea about	SOMERSET, Somerset Co.—Lat. 40° N., Lon. 79° 3′ W.	BEDFORD, Bedford Co. SAMUEL BROWN.	HUNTINGDON, Hun- tingdon County

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